INSTRUCTION MANUAL

EQUIPMENT SHELF ASSEMBLY

MODEL EQH-8VR

COHERENT

COMMUNICATIONS SYSTEMS CORP.

60 COMMERCE DRIVE

HAUPPAUGE, NEW YORK 11788

INSTRUCTION MANUAL

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EQUIPMENT WARRANTY

Coherent Communications Systems Corporation warrants equipment sold by it to be free from defects in material and workmanship under normal use and service for a period of twelve (12) months after installation or eighteen (18) months after date of delivery, whichever shall occur first.

The obligation of Coherent hereunder is limited to repair and/or replacement of any defective part or parts, provided the same are returned, transportation and insurance charges prepaid to the nearest authorized representative within the period of this warranty.

The express warranty made herein shall not be effective if the equipment has been modified without factory authorization or has been subject to misuse, abuse or lack of reasonable care in its use.

In no event shall Coherent be responsible for consequential damages in connection with equipment sold by it.

PRECAUTIONARY NOTICE

1. When inserting an FSM-76 modem module into a working system, follow these precautions:

   a. Insert a dummy plug into the XMIT VF OUT jack (J1) on the FSM-76 module.

   b. Insert the FSM-76 modem into its proper equipment shelf card slot.

   c. Remove the dummy plug from the XMIT VF OUT jack (J1) on the FSM-76 modem module.

INSTRUCTION MANUAL

EQUIPMENT SHELF ASSEMBLY

MODEL EQH-8VR

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Model FSM-76	Frequency Shift Modem
Model LPD-7A	Interface Card
Model EQP-71B	Equipment Power Supply

I. GENERAL DESCRIPTION

The Coherent Communications Systems Corp. Equipment Shelf Assembly, Model EQH-8VR is designed to provide up to twelve (12) Coherent Model FSM-76 Frequency Shift Keyers (Transmit only) whose VF signals are transmitted over individual VF circuits.

The channels are continuous and may be equipped for High Level DC Input operation.

The equipment power supply is built in and is designed to operate from 115VAC/230VAC, 47-63Hz single phase commercial AC power.

II. SPECIFICATIONS

Shelf Capacity:	Up to twelve (12) F.S. Keyers (Transmit only).
VF Line Impedance:	600 ohms, balanced.
Transmit DC Input Keying:	Neutral or Polar; Current Input; Externally limited.
Transmit Level Output:	Adjustable from -45dBm to -5dBm measured at the FSM-76 VF OUT jack.
Transmit Mark Sense:	Normally Mark frequency LOW; strap-selected.
Assembly Dimensions:	Designed to fit a standard 19" rack or cabinet. Vertical rack space required, 5¼".
Approximate Weight:	30 lbs. (13.6 kgs.).
Power Requirements:	115VAC/230VAC, 47-63Hz, Single Phase, 48VA.

III. FUNCTIONAL DESCRIPTION OF MAJOR ASSEMBLY

1. Equipment Shelf Assembly, EQH-8VR (Ref. Dwg. EQH-8VR-99)

The Equipment Shelf Assembly, EQH-8VR houses the following types of modules that provide up to twelve (12) F.S. Keyers over twelve (12) 2-Wire VF line facilities:

a. Frequency Shift Keyer, FSM-76 (one per channel)
   aa. Interface Card, LPD-7A (one for each keyer)
b. Equipment Power Supply, EQP-71B

Mounted in the rear of the EQH-8VR Equipment Shelf Assembly are transformer T13 and connectors J1 and J2.

Transformer T13 provides AC input for the equipment power supply. A slide switch for 115VAC/230VAC operation selection is mounted near transformer T13. A fuse, F1, fuses the AC Input power and is also mounted near transformer T13.

IV. FUNCTIONAL DESCRIPTION OF PLUG-IN CARD MODULES

1. Coherent F.S. Modem *FSM-76
(Ref. Instruction Manual, FSM-76)

The Coherent Communications Model FSM-76 Frequency Shift Modem Card is designed to provide a complete FS channel, both transmit and receive, on a single module. The module can be used for all channel assignments and shifts. This is made possible through use of a unique type of synthesized heterodyne conversion technique utilizing LSI and MSI digital circuits. All LC circuits, filters and their adjustments are eliminated.

A plug-on channel derivation network programs the modem for a family of channels. The modem is then programmed for a particular channel within the family through use of built-in programming switches or plugs.

Each FSM-76 is equipped with a built-in asynchronous regenerator that can be strapped into or out of the circuit as desired. Different bit rates and code level structures are selected by program switches. False start protection and incoming distortion toleration of up to 48% is provided. Output distortion will not exceed 1%.

Diagnostic LED lamps to monitor Transmit Data, Receive Carrier, and Receive Mark and Space are included on the FSM-76 Front Panel. The LED Indicators for Receive Mark and Space allow bias adjustments to be made within 1% without the need of a distortion measuring test set.

Bantam jacks for VF level adjustments or loopback without disrupting other channels are provided. A pair of DC loop (series monitor) jacks and a pair of low level DC jacks for DC loopback are furnished. These jacks are also bantam type.

NOTE: Although each FSM-76 module contains a complete transmit and receive section, only the transmit section is used in the EQH-8VR Equipment Shelf.

Refer to the appended manual for further information.

*U.S. Patent No. 3 932 704

2. Interface Card, LPD-7A
(Ref. Instruction Manual, LPD-7A)

The Model LPD-7A Interface Card provides an appropriate interface between Coherent modems and high level transmit (input) and receive (output) current loops. These loops may be neutral or polar, positive or negative Mark operation using loop currents up to 60mA.

The interface card derives all its inputs and outputs via a modem auxiliary connector.

Normally both Transmit and Receive loops must be provided with external current limiting. Loop voltages may not exceed ±130VDC for polar operation and 260VDC for neutral operation.

Positive and negative Mark options are strap-selected as are polar or neutral and half or full duplex operations.

The LPD-7A Interface Card is completely solid-state and operating speeds of up to 300 BPS may be utilized.

Again, in this shelf, only the transmit section of the interface card is used.

Refer to the appended manual for further information.

3. Equipment Power Supply, EQP-71B
(Ref. Instruction Manual, EQP-71B)

The EQP-71B Equipment Power Supply Module is designed to furnish multiple DC output voltages for equipment power.

AC input voltages to the module, 10.5VAC and 21.0VAC are provided by transformer T13, which is externally-mounted.

The output voltages furnished from the EQP-71B module are regulated +5.5VDC @ 1.85A, regulated +15.5VDC @ 1.5A and unregulated -15VDC @ 100mA.

Two LED pilot lamps are mounted in the module's front panel, one red LED as an AC indicator and one green LED as a DC output indicator.

Refer to the appended manual for further information.

V. FUNCTIONAL DESCRIPTION OF SYSTEM OPERATION

1. General

The following paragraph describes the transmit paths for Channel 1; all other channels are wired to function identically.

2. Transmit Path
(Ref. Dwg. EQH-8VR-01)

Transmit DC signals are brought into the system via the fifty (50) pin connector J2 pins 26 and 1 called TX DC IN to a termination in an LPD-7A Interface Card. This termination is brought via the associated FSM-76 modem edge connector J1, pins 21 and 16.

The LPD-7A Interface Card converts the DC signals to low level binary signals suitable to drive the FSM-76 modem transmit section.

The FSM-76 modem converts binary input signals from the Interface Card to frequency shift analog tones. These tones leave the FSM-76 modem on its edge connector J1, pins 2 and 9 to a termination in transformer T1.

Transmit VF signals leave the system via the thirty-six (36) pin connector J1 pins 1 and 19 called TX VF OUT.

VI. INSTALLATION

1. Mechanical
(Ref. Dwg. EQH-8VR-99)

The Coherent Communications Systems Corporation Model EQH-8VR Equipment Shelf Assembly is designed to mount in a standard 19" rack or cabinet and requires 5¼" of vertical rack space.

Access to the rear as well as the front of the equipment shelf should be provided. The shelf should also be removed as far from sensitive RF equipment as possible to minimize interference.

At the time of installation , review drawing EQH-8VR-99 to insure that all cards are positioned in their allocated slots and are fully inserted.

2. AC Power Connections
(Ref. Dwgs. EQH-8VR-99; EQH-8VR-01)

The Equipment Shelf Asssembly, EQH-8VR is equipped with a 3-conductor power cord and attached plug for connection to commercial AC power.

CAUTION

MAKE SURE that the 115VAC/230VAC selector slide switch mounted in the rear of the Equipment Shelf Assembly, EQH-8VR is in the CORRECT position PRIOR to application of AC power.

3. VF Line Connections
(Ref. Dwgs. EQH-8VR-99; EQH-8VR-01, sh. 1)

Connect the Transmit VF Lines to the rear-mounted thirty-six (36) pin connector J1 as follows:

CHNL NO.	J1 PINS		CONNECT
1	1	Ring	TX VF OUT
	19	Tip	
2	2	Ring	TX VF OUT
	20	Tip	
3	3	Ring	TX VF OUT
	21	Tip	
4	4	Ring	TX VF OUT
	22	Tip	
5	5	Ring	TX VF OUT
	23	Tip	
6	6	Ring	TX VF OUT
	24	Tip	
7	7	Ring	TX VF OUT
	25	Tip	
8	8	Ring	TX VF OUT
	26	Tip	
9	9	Ring	TX VF OUT
	27	Tip	
10	10	Ring	TX VF OUT
	28	Tip	
11	11	Ring	TX VF OUT
	29	Tip	
12	12	Ring	TX VF OUT
	30	Tip	

4. Transmit DC Connections
(Ref. Dwgs. EQH-8VR-99; EQH-8VR-01)

Each DC circuit is terminated in the fifty (50) pin connector called J2. Make the following connections for each circuit as follows:

a. Transmit DC In Channels 1 through 12

CHNL NO.	J2 PINS	CONNECT
1	1 (+)* 26 (-)	TX DC IN
2	2 (+) 27 (-)	TX DC IN
3	3 (+) 28 (-)	TX DC IN
4	4 (+) 29 (-)	TX DC IN
5	5 (+) 30 (-)	TX DC IN
6	6 (+) 31 (-)	TX DC IN
7	7 (+) 32 (-)	TX DC IN
8	8 (+) 33 (-)	TX DC IN
9	9 (+) 34 (-)	TX DC IN
10	10 (+) 35 (-)	TX DC IN
11	11 (+) 36 (-)	TX DC IN
12	12 (+) 37 (-)	TX DC IN

* MARK POLARITY SHOWN

VII. ALIGNMENT PROCEDURES

1. General

Usually an optional Coherent Model MPW-6C Meter Panel is used to provide all test equipment necessary to align and maintain systems utilizing the FSM-76 line of modules.

Only card repair, which is not recommended, requires additional test equipment.

When the Meter Panel, MPW-6C is not made available, the test equipment listed in section 2 of this chapter must be provided instead.

All card strapping should be checked for conformity with desired operating modes PRIOR to system alignment.

2. Test Equipment

Multimeter (VOM).....Triplett Model 630 or equiv.

DB Meter (VTVM).....Hewlett Packard Model 400EL or equiv.

3. Power Supply Adjustments
(Ref. Dwgs. EQH-8VR-99; EQH-8VR-01)

a. Equipment Power Supply, EQP-71B
(Ref. Instruction Manual, EQP-71B)

The EQP-71B Equipment Power Supply Module, which is located in slot J14 of the EQH-8VR Equipment Shelf Assembly is factory adjusted for the correct output voltages. If readjustment is required, proceed as follows:

NOTE that the multimeter (VOM) listed in section 2 of this chapter may be used instead of the optional Meter Panel, MPW-6C shown in the voltage adjustment.

EQP-71B EQUIPMENT POWER SUPPLY

VOLTAGE ADJUSTMENT

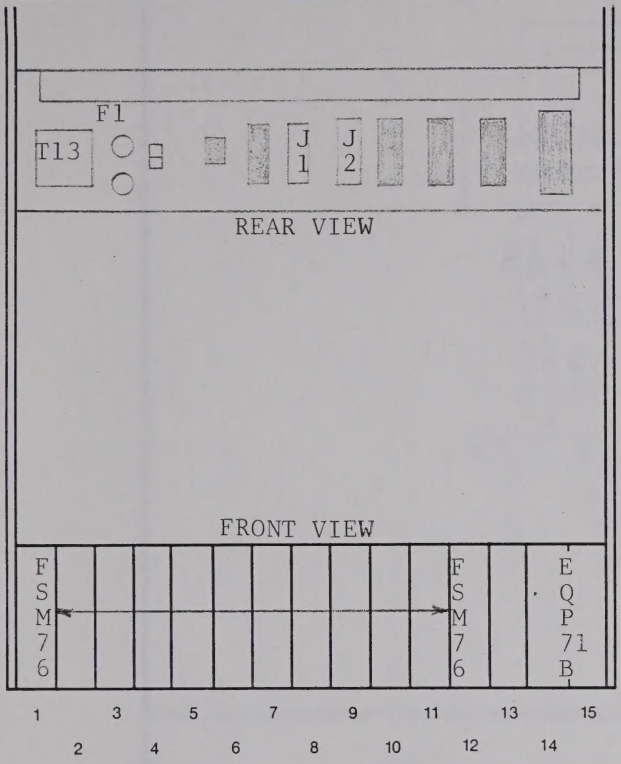
STEP	PROCEDURE
1	PLUG the EQP-71B Equipment Power Supply into an Extender Card.
2	SET the VOM METER SCALE to 25 VOLTS.
3	Connect the VOM across to the edge connector P1, pins 5 (+15.5VDC) and 10 (GND) of the EQP-71B Equipment Power Supply.
4	ADJUST the 1K potentiometer on the EQP-71B Equipment Power Supply for VOLT METER reading of +15.5VDC.
5	REMOVE the VOM.
6	REMOVE the Extender Card and reinsert the EQP-71B Equipment Power Supply in slot J14.
7	NOTE that the +5.5VDC and -15VDC voltages are not adjustable.

4. FSM-76 FSM-76 Transmit Tone Level Adjustment

CONNECT a patchcord from a dB meter, terminated by 600 ohms, to the VF OUT jack on the FSM-76 modem under test.

ADJUST the FSM-76 Modem LEVEL control for the desired output level (normally -10dBm).

Repeat for each FSM-76 keyer in use.



SYSTEM CHARACTERISTICS

CAPACITY: UP TO TWELVE (12) F.S. MODEM CHANNELS. (TRANSMIT ONLY.)

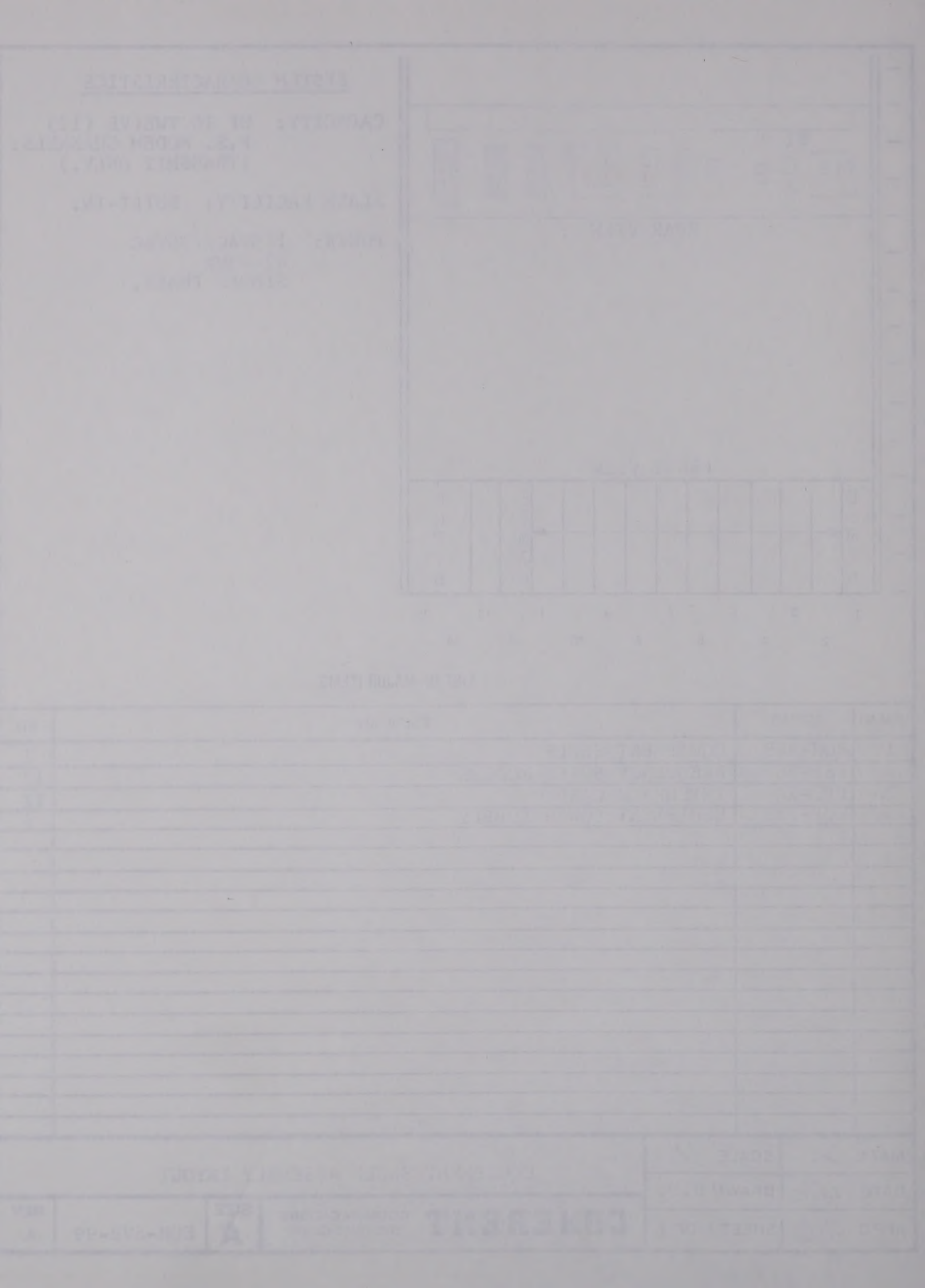
ALARM FACILITY: BUILT-IN.

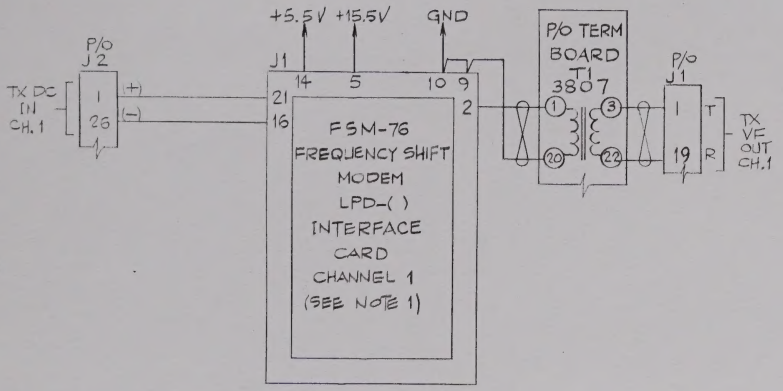
POWER: 115VAC/230VAC
47-63Hz
SINGLE PHASE.

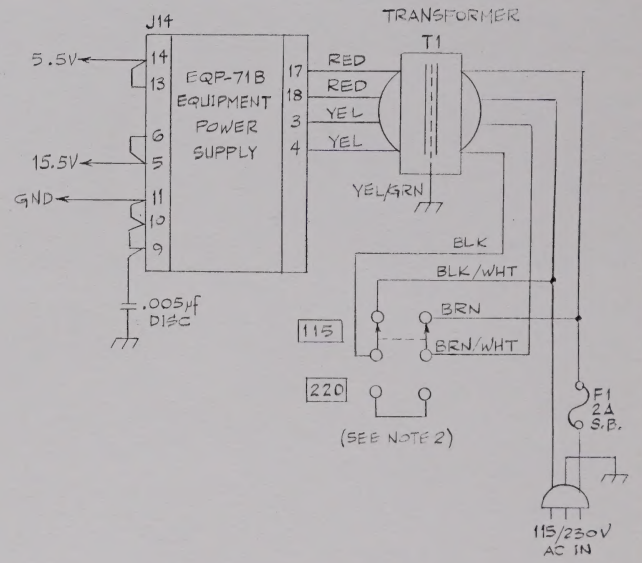
LIST OF MAJOR ITEMS

ITEM NO.	PART NO.	DESCRIPTION	QTY.
1	EQH-8VR	EQUIPMENT SHELF	1
2	FSM-76	FREQUENCY SHIFT MODEMS	12
2a	LPD-7A	INTERFACE CARD	12
3	EQP-71B	EQUIPMENT POWER SUPPLY	1

MAT'L	-	SCALE	-	EQUIPMENT SHELF ASSEMBLY LAYOUT	
DATE	7/22/82	DRAWN	H.M.		
APP'D		SHEET	1 OF 1	COHERENT COMMUNICATIONS SYSTEMS CORP.	SIZE A / EQH-8VR-99 / REV A







NOTES:

1. CHANNEL 1 IS SHOWN, CHANNELS 2 THRU 12 ARE WIRED IN IDENTICAL MANNER TO CHANNEL 1.
2. AC POWER SUPPLY SWITCH S1 SHOWN IN THE 115 VAC OPERATION POSITION. IF SWITCHED TO THE 220 VAC OPERATION POSITION REDUCE FUSE RATING TO ONE-HALF THAT SHOWN.

MAT'L —	SCALE —	SCHEMATIC DIAGRAM-EQUIPMENT SHELF ASSEMBLY POWER SUPPLY & MODEM CIRCUITS (TX ONLY)	
DATE 7-25-85	DRAWN JT		
APP'D	SHEET 1 OF 1	COHERENT COMMUNICATIONS SYSTEMS CORP.	SIZE B — EQH-8VR-01 — REV A

INSTRUCTION MANUAL

FREQUENCY SHIFT MODEM

MODEL FSM-76

ISSUE IX

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FREQUENCY SHIFT MODEM

MODEL FSM-76

INSTRUCTION MANUAL

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PROGRAMMING SHEETS

SHEET 1.	SERIES X, 75 BAUD
SHEET 2.	SERIES A, 110 BAUD
SHEET 3.	SERIES H, 150 BAUD
SHEET 4.	SERIES P, 300 BAUD AND SERIES W, 225 BAUD
SHEET 5.	SERIES Z, 50 BAUD
SHEET 6.	SERIES U, 75 BAUD
SHEET 7.	SERIES S, 110 BAUD
SHEET 8.	SERIES L, 110 BAUD
SHEET 9.	SERIES Y, 150 BAUD
SHEET 10.	SERIES B, 200 BAUD
SHEET 11.	SERIES K, 600 BAUD AND SERIES T, 200 BAUD
SHEET 12.	REGENERATOR PROGRAMMING

ILLUSTRATIONS	DRAWING NUMBER
FREQUENCY SHIFT MODEM BLOCK DIAGRAM	A FSM-76-04

SCHEMATIC DIAGRAMS

FREQUENCY SHIFT MODEM	C FSM-76-05
SERIES SELECTION MODULE	C CDN-1-05

ASSEMBLY DIAGRAM

FREQUENCY SHIFT MODEM	B FSM-76-25

CHAPTER 1

GENERAL DESCRIPTION

1. INTRODUCTION

1.01 The Coherent Communications Frequency Shift Modem Model FSM-76 is a universal single channel Telegraph/Data modem using advanced technology LSI design.

1.02 The modem converts transmitted digital signals to frequency shift analog signals and received frequency shift signals to digital signals. The FSM-76 modem is primarily intended for use in Frequency Division Multiplexing Systems.

1.03 The FSM-76 modem differs from conventional frequency shift keying equipment by completely eliminating all LC filters and their adjustment. This design approach permits use of identical FSM-76 modems for all channel assignments.

1.04 A plug-on channel derivation network programs the modem for a particular series of channels, determining channel spacing, bandwidth and frequency shift.

1.05 A specific channel within a chosen series, such as channel 106 in the CCITT R.35, 120hz spaced series, is selected by means of built-in programming switches. This method provides a far more flexible channel arrangement than conventional designs, resulting in simplified systems planning and logistics.

2. FUNCTIONAL DESCRIPTION

2.01 Refer to the block diagram FSM-76-04 which illustrates the operation of the FSM-76 modem.

2.02 Digitally transmitted data or telegraph signals key a digital frequency modulator. The frequency modulator output is brought to an active band-pass filter which is centered on the transmitted IF frequency.

2.03 The transmitted IF signal is mixed with an internal frequency Fn, which is derived from a crystal controlled frequency synthesizer. The resultant signal is in the voice band and the desired side band is selected by the active low-pass line signal filter and passed to a buffer amplifier. This amplifier furnishes line isolation and level alignment.

2.04 At this point other channel outputs may be paralleled directly together to form an aggregate without any cross loading or interaction. The aggregate is then applied to a line amplifier whose output is connected to the transmission line.

2.05 Received VF signals are brought through a low-pass line signal filter and mixed with an internal frequency Fr, which is derived from the frequency synthesizer.

2.06 The useful signal is extracted by an active filter centered on the IF frequency and brought through a limiter amplifier to the digital discriminator, an active post detection filter and a slicer.

2.07 The demodulated signal is either brought out directly as a low level output signal or passed to a high level output interface card.

2.08 Each FSM-76 modem card is equipped with an asynchronous regenerator which can be strapped into or out of the receive output circuit.

2.09 The two heterodyne conversion frequencies Fn and Fr are independently programmable. This allows the modem to transmit and receive using the same channel frequency for 4-wire operation or different frequencies in each direction for 2-wire operation. When operating the modem in the 2-wire mode both channel frequencies must be in the same series.

2.10 The heterodyne conversion frequencies are determined by the setting of program switches, thereby controlling the selection of any center frequency within a channel series.

TECHNICAL SPECIFICATION SUMMARY

Transmitted Frequency Accuracy:	Better than ±.5Hz
Transmitted Frequency Stability:	Better than ±.1Hz Long Term
Transmitted Tone Level Range:	a. High impedance output from -5dBm to -45dBm. (designed for direct paralleling with other channel outputs) b. 600 ohm output from -1dBm to -45dBm. (for single channel operation)
Transmitted Level Stability:	a. Better than ±.25dB Short Term b. Better than ±1dB Long Term
Harmonic Content:	At least 50dB below the output level.
Modulation Type:	Crystal controlled Coherent Digital Frequency Shift Keying. U.S. Patent No. 3 932 704
Transmit Carrier Control:	Continuous carrier or external carrier control, strap selectable.
Input Keying:	a. ±3VDC to ±25VDC. Input impedance 3000 to 7000 ohms per EIA RS232-C or CCITT recommendation V.24. b. High Level Telegraph signals with auxiliary interface modules.
Keying Sense:	Strap selectable MARK frequency LOW or HIGH.
Receive Input Impedance:	20K minimum, balanced (designed for direct paralleling with other channel inputs)
Nominal Receive Level:	-17dBm per channel
Dynamic Receive Range:	-5dBm to -50dBm without adjustment
Receive Carrier Threshold Control:	-25dBm to -50dBm; approximately 3dB hysteresis; delay approx. 100ms.; MARK or SPACE lock-up is strap selectable.
Automatic Frequency Correction:	Not required for normal offsets. Coherent Communications Pilot AFC Module model AFC-76 provides ±15Hz pull-in and ±25Hz hold for use on circuits requiring frequency correction.

Receive Bias Correction:	Minimum correction range of ±25%
Receive Data Output:	a. ±15VDC with the use of a -15VDC power supply b. High Level Telegraph signals when equipped with auxiliary interface modules
Receive Data Sense:	Strap selectable MARK frequency HIGH or LOW

3. PHYSICAL CHARACTERISTICS

3.01 The FSM-76 modem is built on a single glass-epoxy board measuring 4-1/2" by 11" by 1-1/8" (115mm x280mmx29mm). Up to 12 FSM-76 modules can be accommodated in a Coherent Communications EQH-() shelf which fits into a conventional 19" (483mm) rack or equipment cabinet. The power consumption of this unit is approximately 1/3 that of conventional solid-state modems and provides an important operational economy.

PHYSICAL CHARACTERISTICS SUMMARY

Temperature Range: 0°C to +50°C operation
-20°C to +80°C storage

Size: Height 4-1/2" 115mm
Width 11" 280mm
Depth 1-1/8" 30mm

Weight: 15 ounces (.43kg)

Power Requirements:

Interface	+5.5VDC	+15.5VDC	-15.5VDC
NONE (EIA/V.24)	100	120	5
LPD-7()	115	120	
LPD-10A	100	135	
LPD-11()	115	120	
TLI-2A	130	120	
TLI-3A	130	120	
TLI-4()	135	120	
LPD-14A	130	120	

4. BUILT-IN INTERFACE CAPABILITIES

4.01 The FSM-76 modem is designed to operate without an interface module when used in systems that utilize EIA RS-232-C or CCITT V.24 conventions. A negative voltage of approximately 15VDC is required to provide Mark received data out signals.

INTERFACE SUMMARY

Circuits Provided:	Function	EIA Desig.	CCITT Desig.
	Signal Ground	AB	CKT 102
	Transmit Data	BA	CKT 103
	Receive Data	BB	CKT 104
	Carrier Control	CA	CKT 105
	Carrier Detect	CF	CKT 109

Signal Sense:	MARK	SPACE
Transmit Data	-3VDC to -25VDC	+3VDC to +25VDC
Receive Data	-15VDC	+15VDC

Strap selectable MARK frequency HIGH or LOW.

Carrier Control +3VDC to +25VDC for Carrier On
-3VDC to -25VDC for Carrier Of

Strap selectable Continuous Carrier On.

Carrier Detect +15VDC for Carrier Received
-15VDC for Carrier Level Loss

The Carrier Detect threshold is adjustable.

5. INTERFACE OPTIONS

5.01 A wide variety of interface cards can be provided for special requirements. Contact the factory for information.

LPD-10 INTERFACE CARD SUMMARY

Modes of Operation:	Half-duplex
	Full-duplex
	Simplex
Send Loop Input:	Isolated (Floating)
Send Loop Current:	Neutral (single current) 20mA to 60mA nominal line current
	Polar (double current) ±10mA to ±60mA

Receive Loop Output:	Isolated using a mercury wetted contact relay. Maximum speed 150BPS

TLI-2 AND TLI-4 INTERFACE CARD SUMMARY

Mode of Operation:	Telex 20mA to 60mA Neutral 5mA Idle

6. DIAGNOSTIC FACILITIES

6.01 The FSM-76 modem front panel is equipped with diagnostic LED indicators that provide the status of Transmitted Data, Receive Carrier and Receive Mark and Space. The latter two permit the receive bias adjustment to be made within 1% without the need for a distortion measuring set (TDMS).

6.02 A carrier alarm closure to ground output is provided for the operation of an optional alarm module ALN-76 or remote alarm operation.

DIAGNOSTIC FACILITIES SUMMARY

LED Indicators:	Function	Sense
	Transmit Data	on for Space
	Receive Mark	on for Mark
	Receive Space	on for Space
	Receive Carrier	on for carrier presence
Alarm Closure Output:	Open-collector transistor output (NPN) Closure for receive carrier loss Maximum current 60MA Maximum voltage +150V	

7. MONITORING FACILITIES

7.01 Each FSM-76 modem is equipped with six bantam jacks to facilitate monitoring and alignment tasks without disrupting other channels.

MONITORING FACILITIES SUMMARY

Designation	Function	Type
J1	Transmit VF Out	Equipment
J2	Receive VF In	Equipment
J3	Lo-Level Test In	Equipment
J4	Lo-Level Test Out	Monitor
J5	Transmit Loop Monitor	Series Monitor
J6	Receive Loop Monitor	Series Monitor

8. REGENERATOR

8.01 Each FSM-76 modem is equipped with a built-in asynchronous regenerator which can be strapped into or out of the receive data circuit as required.

8.02 Eight different internally generated speeds ranging from 45 BPS to 150 BPS and code structures from 5 to 8 intelligence levels may be selected by program switches. External clocking may also be used

8.03 The circuit has false start protection and can tolerate incoming distortion of up to 48%, while its output distortion does not exceed 1%. The regenerator meets CCITT recommendation U.5.

REGENERATOR SUMMARY

Maximum Input Distortion: 48%

Maximum Output Distortion: 1%

False Start Protection: Minimum start bit internal is 50% of the ideal bit period.

Speed (BPS)	Code Level
45.45	5
50	5
56.88	6
74.2	5
75	5
110	8
134.4	7
150	8

CHAPTER 2

THEORY OF OPERATION

1. TRANSMIT SECTION

1.01 Refer to the FSM-76 modem schematic FSM-76-05 and the Derivation Network schematic CDN-1-05.

1.02 High level transmitted data is applied to pins 21(+) and 16 (-) of the FSM-76 card connector P4. The signal is brought via the TX LOOP MON bantam jack to a high level interface card which is installed in connector P3. The interface card isolates the transmit input loop from the circuitry on the card and converts the signals to TTL levels. These signals are applied to NAND gate AG1d. Both senses of the data are available at the outputs of AG1C and inverter IN1d. The desired sense is selected by the TX MARK FREQ strap and brought to the KI input of the LSI device IC1.

1.03 If the data source is EIA or CCITT V.24, the transmitted signals enter at pin 4 of the FSM-76 connector P4. Signals are then brought via the LO-LEVEL TEST IN bantam jack through the inverting transistor Q17 to NAND gate AG1a. No interface card is used.

1.04 The LSI device IC1 is programmed for the required IF frequency and mark-space shift by selected closures to ground applied to inputs S1 through S4 from the channel derivation network CDN-1 via pins 1 and 2 of connectors P1 and P2.

1.05 The programmed transmit IF frequency is brought out of the IC1 pin called FM. The IF frequency derived from this point is shifted above or below its center frequency depending on the data sense on the IC1 input KI. The amount of frequency shift deviation is dependent on the channel series that IC1 has been programmed for by the channel derivation network.

1.06 The signals then enter a transmit IF filter on the CDN-1 channel derivation network through FSM-76 connector P1 pin 3. They are returned on P2 pin 3 and applied to the product modulator LA8. The transmit heterodyne conversion frequency Fn from IC1 is also applied to product modulator LA8 which provides generation of a double sideband carrier signal. Programming IC1 from the program switch XP2 increments the conversion frequency Fn so that the lower side band corresponds to the desired channel within the chosen series.

1.07 The signals are then brought through the transmit level control located on the channel derivation network CDN-1 via FSM-76 connector P1 pins 9 and 8.

1.08 An active low-pass filter comprised of LA4b and LA5b eliminates the upper side band.

1.09 The line signal is then applied to LA4a which constitutes a current source. The Z OUT straps provide the option of either a 600 ohm output (LO Z out) or the current source output (HI Z out). The selected channel signal is brought to the FSM-76 card connector P4 pin 2 TRANSMIT AGG via the XMIT VF OUT bantam jack. If the current source is selected, a 600 ohm termination must be provided either as the input to a line amplifier, or an actual resistive termination. Multiple channel outputs can be combined across this termination with no interaction.

1.10 If the transmitted VF is looped back to the receiver section by patching directly from the XMIT

VF OUT jack to the REC VF IN jack, a 600 ohm termination, R53, is automatically provided through the XMIT VF OUT jack sleeve connection.

1.11 Transmitted carrier can be either externally controlled through the FSM-76 card connector P4, pin 12 via transistor Q19 to input CC on IC1 or forced on continuously by making the CAR CTRL INT strap. This strap holds Q19 on, which forces a ground to IC1 input CC. When a plug is inserted into the LO-LEVEL TEST IN jack the ground at the junction between R113 and R114 is removed which also turns Q19 on.

2. RECEIVE SECTION

2.01 The receive VF aggregate line signal is connected through the FSM-76 card connector P4 pins 1 and 3. The signal is transformer coupled by T1 to an active low-pass filter consisting of LA6a and LA6b via the REC VF IN bantam jack. The filter removes noise and any out of band components.

2.02 The filtered VF aggregate signal is then applied to product modulator LA7a. The receive heterodyne conversion frequency Fr is also applied to the product modulator LA7a from IC1 via inverter IN1b to produce a double sideband suppressed IF carrier signal. This signal is the resultant of the desired channel within the chosen series and the Fr frequency.

2.03 The heterodyne conversion frequency Fr is programmed automatically by XP2 switch positions when XP1 is not installed. When the modem is used in this mode, Fr will equal the Fn transmit heterodyne frequency. The receive section of the modem is then able to decode the same channel frequency that the transmit section is generating.

2.04 When installed, the switch assembly XP1 provides receive heterodyne frequency Fr programming that is independent of Fn. This allows the receive section of the modem to decode a different channel than the one being transmitted. Both channels must be programmed within the same series.

2.05 The IF signal produced by the product modulator is applied to the receive IF filter on the CDN-1 channel derivation network through the FSM-76 connector P2 pin 4. This filter removes unwanted frequencies and the filtered IF signal is returned to the FSM-76 through connector P3 pin 5 and applied to product modulator LA7b. An IC1 derived frequency Fd is also applied to the LA7b product modulator and the resultant frequency is brought to the second section of the IF filter on the CDN-1 through FSM-76 connector P2, pin 8. The Fd frequency is constant for all channels within a particular channel series.

2.06 The filtered signal is brought back into the FSM-76 module through connector P1, pin 4 and applied to limiter LA9 which expands the zero crossings of the filtered signal into square waves over a large dynamic range to eliminate the effects of amplitude variations. Transistor Q16 and NAND gate AG1b provide further limiting and convert the signal to TTL levels.

2.07 The signal is routed to the IC1 input DI where a crystal controlled digital discriminator converts frequency to a dc voltage proportional to the deviation from center frequency.

2.08 This voltage, which is brought from the IC1 output DO, is returned to the CDN-1 through FSM-76 connector P2, pin 9 via inver-

ter IN1c. A low-pass post detection filter on the CDN-1 eliminates extraneous components and forms the "eye" pattern of the demodulated data signal. This signal is applied to a slicer for conversion to low level data. The bias control potentiometer is part of this circuit.

2.09 Strap options furnish recognition of received MARK frequency HIGH or LOW and select the carrier failure MARK or SPACE sense.

2.10 The low level data signal is returned to the FSM-76 modem through connector P1 pin 7. It is inverted by IN1e and routed to the output driver LA3b.

The output driver LA3b provides an EIA/CCITT V.24 polar output on card connector P4 pin 6 if a negative dc supply voltage is connected to P4, pin 15. When high level telegraph receive output signals are desired, an interface card is installed in connector P3. The output driver LA3b also provides signals to drive the high level interface card through connector P3 pin 13.

2.11 The low-level received data that is returned from the CDN-1 on connector P1, pin 7 is also applied to transistors Q1, Q2 and the active low-pass filter LA1a. This circuit heavily integrates the data so that an average of the MARK and SPACE intervals is generated. By comparing this average to two threshold voltages with comparators LA3a and LA3b, the MARK and SPACE LED indicators will both be on if the average is within the required thresholds. This occurs when bias distortion for reversals is minimized. During normal traffic the indicators display MARK or SPACE status. This circuit is designed to allow bias adjustments within 1% without additional equipment.

2.12 The receive base-band signal is applied to a receive carrier level detector on the CDN-1 and compared with a receive carrier threshold control derived level. When the receive base-band signal is below the set threshold the detector develops a signal that locks up the receive data in steady MARK or SPACE depending on the LOCK-TO strap chosen. The carrier threshold signal is also applied through connector P1 pin 10 to LA3a and the RX CARR LED indicator. The LA3a output provides an EIA/CCITT V.24 CARRIER DETECT signal to the FSM-76 card connector P4 pin 11. An open collector NPN transistor output is provided on P4 pin 8 for control of a remote alarm or the optional Coherent Alarm Module ALN-76.

3. REGENERATOR

3.01 The received data at the output of inverter IN1e is routed directly to the output driver LA3b when the REGEN OUT strap is made. If the REGEN IN option is chosen, data signals are routed to the output driver LA3b from the IC1 regenerator output RGO. The regenerator operates as follows:

3.02 A MARK to SPACE start bit transition activates a digital counter which samples the center of each of N bits every T interval. The number of bits N is dependent on the code structure programmed and T corresponds to the bit interval. The programming is performed through the use of programming switch assembly XP3.

3.03 If the first transition, after the start bit transition occurs less than 50% of a bit interval later, the sampling process is inhibited. This provides false start protection to prevent erroneous receive data outputs caused by noise or line hits.

3.04 The regenerated data distortion will not exceed 1% for input distortions that are as high as 48%

CHAPTER 3

PREPARATION FOR INSTALLATION

1. CHANNEL DERIVATION NETWORK, CDN-1

1.01 The plug-on Channel Derivation Network CDN-1-() determines the channel series within which a particular FSM-76 modem will operate.

1.02 The Channel Derivation Network designation CDN-1 includes an alpha type suffix which assigns it to a particular channel series as shown in table 1.

TABLE 1 CHANNEL DERIVATION NETWORK TYPE SUFFIX

SERIES TYPE SUFFIX	REFERENCE	CHANNEL SEPERATION HZ	SHIFT	MAXIMUM KEYING RATE BAUD
CDN-1-X	CCITT R.35	120	±30	75
H	CCITT R.37	240	±60	150
W	CCITT R.38B	360	±90	225
P	CCITT R.38A	480	±120	300
Z	COHERENT HIGH DENSITY	80	±20	50
A	CCITT R.39	170	±42.5	110
B	MIL-STD-188	340	±85	200
S	W.E. 43A	170	±35	110
T	W.E. 43B	340	±70	200
L	CAN BELL	150	±45	110
K	WIDEBAND	960	±240	600
U	W.U. TYPE 81	150	±35	75
Y	W.U. TYPE 82	300	±80	150

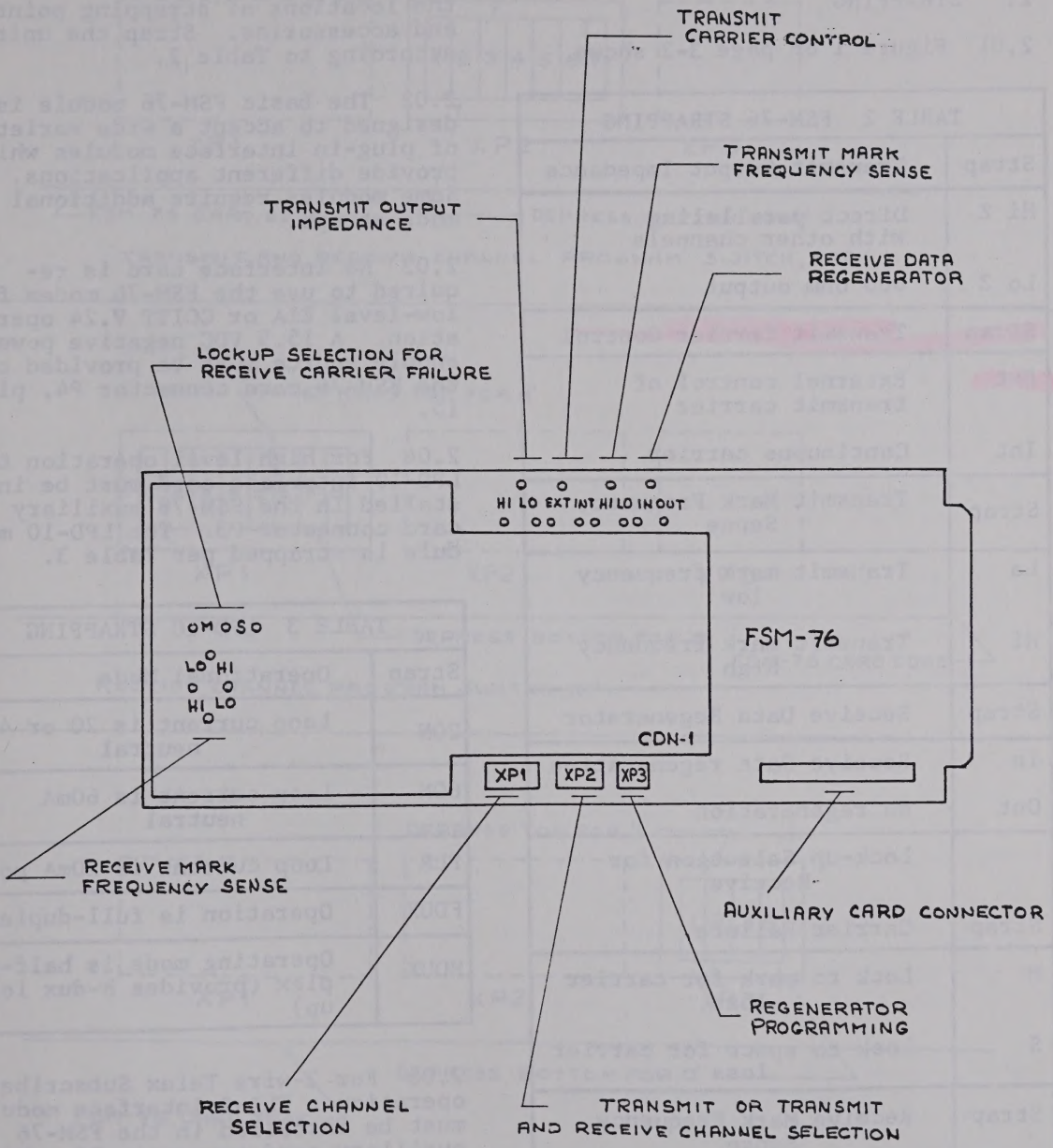


Fig.1. STRAPPING AND PROGRAMMING DIAGRAM

2. STRAPPING

2.01 Figure 1 on page 3-2 shows the locations of strapping points and accessories. Strap the unit according to Table 2.

TABLE 2 FSM-76 STRAPPING	
Strap	Transmit Output Impedance
Hi Z	Direct paralleling with other channels
Lo Z	600 ohm output
Strap	Transmit Carrier Control
Ext	External control of transmit carrier
Int	Continuous carrier
Strap	Transmit Mark Frequency Sense
Lo	Transmit mark frequency low
Hi	Transmit mark frequency high
Strap	Receive Data Regenerator
In	Receive Data regeneration
Out	No regeneration
	Lock-up Selection for Receive
Strap	Carrier Failure
M	Lock to mark for carrier loss
S	Lock to space for carrier loss
Strap	Receive Mark Frequency Sense
Lo	Make both Lo straps for mark frequency low
Hi	Make both Hi straps for mark frequency high

2.02 The basic FSM-76 module is designed to accept a wide variety of plug-in interface modules which provide different applications. Some modules require additional mode straps.

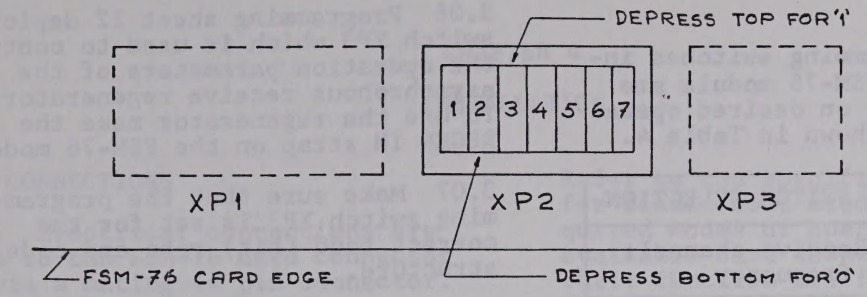
2.03 No interface card is required to use the FSM-76 modem for low-level EIA or CCITT V.24 operation. A 15.5 VDC negative power supply source must be provided to the FSM-76 card connector P4, pin 15.

2.04 For high level operation the LPD-10 interface card must be installed in the FSM-76 auxiliary card connector P3. The LPD-10 module is strapped per Table 3.

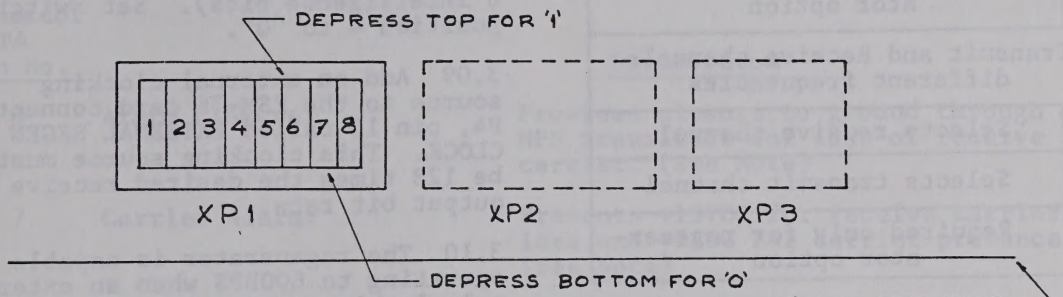
TABLE 3 LPD-10 STRAPPING	
Strap	Operational Mode
20N	Loop current is 20 or 40mA neutral
60N	Loop current is 60mA neutral
PLR	Loop current is 20mA polar
FDUX	Operation is full-duplex
HDUX	Operating mode is half-duplex (provides h-dux lock-up)

2.05 For 2-wire Telex Subscriber operation a TLI-2 interface module must be installed in the FSM-76 auxiliary card connector P3. No strapping is necessary. For exchange end operation install the TLI-4 interface module instead.

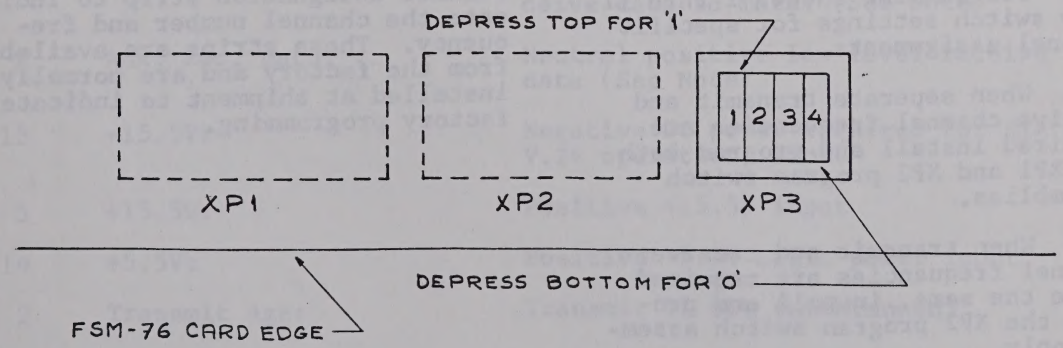
2.06 The regenerator must be strapped out for Telex Exchange operation.



TRANSMIT AND RECEIVE CHANNEL PROGRAM SWITCH, XP2



RECEIVE CHANNEL PROGRAM SWITCH, XP1



REGENERATOR PROGRAM SWITCH, XP3

Fig. 2. PROGRAM SWITCH PLACEMENT AND DESIGNATION

3. PROGRAMMING

3.01 The programming switches installed on the FSM-76 module are chosen depending on desired operational mode as shown in Table 4.

TABLE 4 PROGRAM SWITCH SELECTION	
Transmit and Receive channels identical frequency	
XPI	Not used
XP2	Selects both channels
XP3	Required only for regenerator option
Transmit and Receive channels different frequencies	
XPI	Selects receive channel
XP2	Selects transmit channel
XP3	Required only for regenerator option

3.02 Refer to figures 1 and 2 on pages 3-2 and 3-4 respectively for program switch XP1, XP2 and XP3 locations.

3.03 Programming sheets 1 thru 11 show switch settings for specific channel assignments.

3.04 When seperate transmit and receive channel frequencies are required install and program both the XP1 and XP2 program switch assemblies.

3.05 When transmit and receive channel frequencies are required to be the same, install and program the XP2 program switch assembly only.

3.06 Programming sheet 12 depicts switch XP3 which is used to control the operation parameters of the asynchronous receive regenerator. To use the regenerator make the REGEN IN strap on the FSM-76 modem.

3.07 Make sure that the programming switch XP3 is set for the correct baud (bit) rate and code structure.

3.08 If the correct bit rate/code structure is not available through XP3 programming, set XP3 programming switch positions 1 thru 3 for the proper code structure (5,6,7 or 8 intelligence bits). Set switch position 4 to "0".

3.09 Add an external clocking source to the FSM-76 card connector P4, pin 13 called EXTERNAL REGEN CLOCK. This clocking source must be 128 times the desired receive output bit rate.

3.10 The regenerator is capable of operating to 600BPS when an external clocking source is used.

4. CHANNEL DESIGNATION MARKING

4.01 The front panel of the FSM-76 has provisions for insertion of a channel designation strip to indicate the channel number and frequency. These strips are available from the factory and are normally installed at shipment to indicate factory programming.

CHAPTER 4

INSTALLATION

1. CONNECTIONS

1.01 Electrical connections are made to the FSM-76 card connector P4 via a mating 44 pin connector. Refer to the specific system manual for connections used for the required modes of operation. The available card connections and their function are found in the following summary.

ELECTRICAL CONNECTION SUMMARY

Connector P4 Pin No.		Description
8	Alarm Closure:	Provides closure to ground through an NPN transistor for loss of receive carrier. (See Note)
7	Carrier Alarm:	Presents +13VDC for receive carrier loss and +2VDC for carrier presence. (See Note)
11	Carrier Detect:	EIA or V.24 receive carrier status output.
6	Receive Data:	EIA or V.24 receive data output.
D	Receive Data Lockup:	Grounding this lead locks up the receive data to mark. (See Note)
X	Aux. Rec. Data:	Neutral positive low-level receive data (See Note)
15	-15.5V:	Negative DC power required for EIA or V.24 operation, input
5	+15.5V:	Positive +15.5V input
14	+5.5V:	Positive +5.5V Logic power input
2	Transmit Agg:	Transmit VF Out (unbalanced)
1 3	Rec. Agg:	Receive VF in (balanced)
9	Ground:	Signal common
13	External Regen Clock:	External clock input for non-standard speeds. (See Note)

Connector P4 Pin No.		Description
12	Ext Carrier Control:	EIA or V.24 transmit carrier control
4	Transmit Data:	EIA or V.24 transmit data
20 Z Y	Aux. Connections:	(See Note)
21	Positive Loop Input:	Hi level transmit loop positive input
16	Negative Loop Input:	Hi level transmit loop negative input
17	Mark Battery:	Mark battery input for high level receive output.
18	Space Battery:	Space battery input for high level receive output.
19	Batt. Common:	Common input of high level battery.
22	Tongue:	Tongue output of high level receive data.

Note: A number of interface connections are provided for special applications and are not used during normal operation.

CHAPTER 5

ALIGNMENT PROCEDURES

1. TEST EQUIPMENT

1.01 It is strongly recommended that the Coherent Communications Meter Panel Assembly, Model MPW-2A be utilized in systems equipped with the Coherent Frequency Shift Modem Model FSM-76.

1.02 The MPW-2A Meter Panel furnishes all measurement and signal generation capabilities necessary to align and maintain systems containing the FSM-76 line of modules and is equipped as follows.

1.03 Dual range (50ma/100ma) MA Meter.

1.04 Multirange (-40dBm to +10dBm) VU Meter.

1.05 Multispeed Dotter (Reversal Generator) 20, 40 or 60ma signal, polar or neutral operation. Low level signal available.

1.06 1KHZ oscillator, -30dBm to +7dBm output.

1.07 Test Attenuator, 16dB H-pad.

1.08 The following test equipment is required to align the FSM-76 module if the MPW-2A meter panel is not made available. Additional test equipment may be required for total system alignment.

1.09 Pattern Generator, Digitech Model 2150 or equivalent.

1.10 DB Meter, Hewlett Packard Model 400EL or equivalent.

2. TRANSMIT LEVEL ALIGNMENT

2.01 Connect a bantam patchcord between the FSM-76 XMIT VF OUT jack J1 and a DB Meter TERMINATED in 600 ohms.

2.02 The FSM-76 module is automatically disconnected from the transmit VF aggregate buss when the patchcord is plugged into jack J1 and the meter will show the transmitted CHANNEL VF tone.

2.03 If the FSM-76 is strapped for external carrier control and the carrier is not turned on, insert a dummy plug into the LO-LEVEL TEST IN jack J3. The dummy plug insertion will force the carrier on by lifting the J3 ring ground.

2.04 Adjust the multiturn XMIT LEVEL control for the required output.

2.05 Low-level MARK, SPACE or REVERSALS can be inserted through jack J3 from a low level data source as the MPW-2A Meter Panel.

3. RECEIVE ALIGNMENTS SIGNAL SOURCE

3.01 In order to perform a checkout of the receive section of the FSM-76 modem, a source of frequency shift keying signals is required. This can normally be provided by the corresponding transmit section of the same FSM-76, unless transmit and receive frequencies are programmed differently. If this is the case, remove programming switch assembly XP1, located on the FSM-76 card prior to patching the channel back-to-back.

3.02 Removal of XP1 automatically matches the receive section to the transmit section program.

4. BIAS ADJUSTMENT

4.01 Back up the FSM-76 modem by connecting a patchcord between the XMIT VF OUT J1 and REC VF IN J2 jacks.

4.02 Furnish a data source that provides 1:1 reversals at the keying rate of the channel by connecting a bantam patchcord between the LO-LEVEL TEST IN J3 jack and an MPW-2A meter panel or other pattern generator.

4.03 Adjust the BIAS control until both the M and S RX DATA LED indicators are lit solidly with no flickering.

4.04 If the CDN-1 channel derivation network is replaced, make the bias adjustment prior to returning the channel to normal serivce.

5. RECEIVE THRESHOLD ADJUSTMENT

5.01 The carrier threshold is factory adjusted for a level of -35dBm at the receive VF input terminals. To readjust proceed as follows:

5.02 Connect a patchcord between the XMIT VF OUT J1 jack on the FSM-76 module and a DB meter TERMINATED in 600 ohms.

5.03 Adjust the XMIT LEVEL control for the desired threshold level as measured on the DB meter.

5.04 Disconnect the meter, and connect the XMIT VF OUT J1 jack directly to the REC VF IN J2 jack.

5.05 Adjust the THRESHOLD control slowly clockwise, STARTING from the fully counter-clockwise position until the RX CARR LED goes out, then turn the control slowly counter-clockwise until the LED just goes on.

5.06 Reset the FSM-76 to its normal transmit level (refer to section 2 of this chapter)

6. LOOP MONITORING

6.01 The FSM-76 module furnishes transmit loop (J5) and receive loop (J6) monitor jacks for systems using high level current loops.

6.02 To monitor loop currents or signals connect a bantam patchcord from the appropriate jack to a MA meter.

6.03 The receive low level data out signal is accessed through the LO-LEVEL TEST OUT J4 jack.

CHAPTER 6

ORDERING INFORMATION

1. DESIGNATION PROCEDURE

1.01 To order a complete channel or the channel derivation network only, specify the appropriate part number from table 5.

1.02 To order an FSM-76 modem without a channel derivation network, specify FSM-76-0

TABLE 5

CHANNEL DERIVATION NETWORK SUFFIX

SERIES	REFERENCE	CHANNEL SEPARATION Hz	SHIFT Hz	MAXIMUM KEYING RATE BAUD	PART NUMBER COMPLETE CHANNEL	PART NUMBER CHAN. DERIV. NETWORK ONLY
X	CCITT R.35	120	±30	75	FSM-76-X	CDN-1-X
H	CCITT R.37	240	±60	150	FSM-76-H	CDN-1-H
W	CCITT R.38B	360	±90	225	FSM-76-W	CDN-1-W
P	CCITT R.38A	480	±120	300	FSM-76-P	CDN-1-P
Z	COHERENT HIGH DENSITY	80	±20	50	FSM-76-Z	CDN-1-Z
A	CCITT R.39	170	±42.5	110	FSM-76-A	CDN-1-A
B	MIL-STD-188	340	±85	200	FSM-76-B	CDN-1-B
S	W.E. 43A	170	±35	110	FSM-76-S	CDN-1-S
T	W.E. 43B	340	±70	200	FSM-76-T	CDN-1-T
L	CAN. BELL	150	±45	110	FSM-76-L	CDN-1-L
K	WIDEBAND	960	±240	600	FSM-76-K	CDN-1-K
U	W.U. TYPE 81	150	±35	75	FSM-76-U	CDN-1-U
Y	W.U. TYPE 82	300	±80	150	FSM-76-Y	CDN-1-Y

2. CHANNEL PROGRAMMING ASSIGNMENTS

2.01 The FSM-76 must be supplied with either programming switches or programming plugs to determine its channel assignment. Refer to Table 6 for Channel Programming Part Numbers.

TABLE 6

CHANNEL PROGRAMMING PART NUMBERS

FSM-76-2 Identical send and receive frequencies, switch selected .
FSM-76-3 Seperate send and receive frequencies, switch selected.
FSM-76-4 Identical send and receive frequencies, fixed program plug, specify desired channel number or frequency.
FSM-76-5 Seperate send and receive frequencies, fixed program plug, specify desired channel number or frequency.

NOTE: The program switch for the Regenerator (4 position DIP switch) is always supplied. Refer to Chapter 3, paragraphs 3.06-3.10, page 3-5 for details.

3. INTERFACE OPTIONS

3.01 The plug-in interface modules shown in Table 7 should be specified seperately if required.

TABLE 7

PLUG-IN INTERFACE CARD LIST

Module	Description
LPD-10A	High level TTY Interface Neutral or Polar 20, 40 or 60mA loops Mercury wetted contact relay
LPD-7A	High Level TTY Interface Neutral or Polar 20, 40 or 60 mA loops Solid State Output Relay
LPD-11A	High Level TTY Interface Polar 20mA, receive loop automatically regulated. Solid State Output Relay
TLI-2A	Telex 40 or 60 mA Neutral 5mA Idle Subscriber End
TLI-4A	Telex 40 or 60 mA Neutral 5mA Idle Central Office End

4. OPTIONAL DEVICES

4.01 A list of commonly used Optional Devices is found in Table 8.

TABLE 8

OPTIONAL DEVICES

Module	Description
ALN-76	Carrier and power supply Alarm Card
AFC-76	Pilot AFC Module, automatic frequency translation compensator.
LNA-76	Dual Line Amplifier
MPW-2A	Meter Panel Assembly, furnishes measuring equipment and test signal generation.

CHANNEL			SWITCH POSITION							
No.	CCITT R.35	CENTER FREQ.	1	2	3	4	5	6	7	8*
99		300	1	0	0	0	0	0	1	1
1	101	420	1	0	0	0	0	1	1	1
2	102	540	1	0	0	0	1	0	1	1
3	103	660	1	0	0	0	1	1	1	1
4	104	780	1	0	0	1	0	0	1	1
5	105	900	1	0	0	1	0	1	1	1
6	106	1020	1	0	0	1	1	0	1	1
7	107	1140	1	0	0	1	1	1	1	1
8	108	1260	1	0	1	0	0	0	1	1
9	109	1380	1	0	1	0	0	1	1	1
10	110	1500	1	0	1	0	1	0	1	1
11	111	1620	1	0	1	0	1	1	1	1
12	112	1740	1	0	1	1	0	0	1	1
13	113	1860	1	0	1	1	0	1	1	1
14	114	1980	1	0	1	1	1	0	1	1
15	115	2100	1	0	1	1	1	1	1	1
16	116	2220	1	1	0	0	0	0	1	1
17	117	2340	1	1	0	0	0	1	1	1
18	118	2460	1	1	0	0	1	0	1	1
19	119	2580	1	1	0	0	1	1	1	1
20	120	2700	1	1	0	1	0	0	1	1
21	121	2820	1	1	0	1	0	1	1	1
22	122	2940	1	1	0	1	1	0	1	1
23	123	3060	1	1	0	1	1	1	1	1
24	124	3180	1	1	1	0	0	0	1	1
25	125	3300	1	1	1	0	0	1	1	1

*NOTE: SWITCH POSITION 8 IS USED FOR PROGRAM SWITCH ASSEMBLY XP1 ONLY.

120hz SEPARATION
±30hz SHIFT
75 BAUD

SERIES X

PROGRAM SHEET 1

CHANNEL		SWITCH POSITION							
No.	CENTER FREQ.	1	2	3	4	5	6	7	8*
1	425	0	1	0	1	1	1	1	1
2	595	0	1	1	0	0	0	1	1
3	765	0	1	1	0	0	1	1	1
4	935	0	1	1	0	1	0	1	1
5	1105	0	1	1	0	1	1	1	1
6	1275	0	1	1	1	0	0	1	1
7	1445	0	1	1	1	0	1	1	1
8	1615	0	1	1	1	1	0	1	1
9	1785	0	1	1	1	1	1	1	1
10	1955	1	0	0	0	0	0	1	1
11	2125	1	0	0	0	0	1	1	1
12	2295	1	0	0	0	1	0	1	1
13	2465	1	0	0	0	1	1	1	1
14	2635	1	0	0	1	0	0	1	1
15	2805	1	0	0	1	0	1	1	1
16	2975	1	0	0	1	1	0	1	1
17	3145	1	0	0	1	1	1	1	1
18	3315	1	0	1	0	0	0	1	1

*NOTE: SWITCH POSITION 8 IS USED FOR PROGRAM SWITCH ASSEMBLY XP1 ONLY.

170hz SEPARATION
±42.5hz SHIFT
110 BAUD

SERIES A
PROGRAM SHEET 2

CHANNEL			SWITCH POSITION
No.	CCITT R.37	CENTER FREQ.	1 2 3 4 5 6 7 8*
1	201	480	1 0 0 0 1 0 0 1
2	202	720	1 0 0 1 0 0 0 1
3	203	960	1 0 0 1 1 0 0 1
4	204	1200	1 0 1 0 0 0 0 1
5	205	1440	1 0 1 0 1 0 0 1
6	206	1680	1 0 1 1 0 0 0 1
7	207	1920	1 0 1 1 1 0 0 1
8	208	2160	1 1 0 0 0 0 0 1
9	209	2400	1 1 0 0 1 0 0 1
10	210	2640	1 1 0 1 0 0 0 1
11	211	2880	1 1 0 1 1 0 0 1
12	212	3120	1 1 1 0 0 0 0 1

*NOTE: SWITCH POSITION 8 IS USED FOR PROGRAM SWITCH ASSEMBLY XP1 ONLY.

240Hz SEPARATION
+60Hz SHIFT
150 BAUD

SERIES H

PROGRAM SHEET 3

SERIES P

CHANNEL No.	CCITT R.38A	CENTER FREQ.	SWITCH POSITION 1	2	3	4	5	6	7	8*
1	401	600	1	0	0	0	1	1	0	1
2	402	1080	1	0	0	1	1	1	0	1
3	403	1560	1	0	1	0	1	1	0	1
4	404	2040	1	0	1	1	1	1	0	1
5	405	2520	1	1	0	0	1	1	0	1
6	406	3000	1	1	0	1	1	1	0	1
56	NON-STD	2760	1	1	0	1	0	1	0	1

480hz SEPARATION
±120hz SHIFT
300 BAUD

SERIES W

CHANNEL No.	CCITT R.38B	CENTER FREQ.	SWITCH POSITION 1	2	3	4	5	6	7	8*
1	301	540	1	0	0	0	1	0	1	1
2	302	900	1	0	0	1	0	1	1	1
3	303	1260	1	0	1	0	0	0	1	1
4	304	1620	1	0	1	0	1	1	1	1
5	305	1980	1	0	1	1	1	0	1	1
6	306	2340	1	1	0	0	0	1	1	1
7	307	2700	1	1	0	1	0	0	1	1
8	308	3060	1	1	0	1	1	1	1	1

360hz SEPARATION
±90hz SHIFT
225 BAUD

*Note: SWITCH POSITION 8 IS USED FOR PROGRAM SWITCH ASSEMBLY XP1 ONLY.

CHANNEL		SWITCH POSITION
No.	CENTER FREQ.	1234 5678*
99	320	0110 0011
1	400	0110 0101
2	480	0110 0111
3	560	0110 1001
4	640	0110 1011
5	720	0110 1101
6	800	0110 1111
7	880	0111 0001
8	960	0111 0011
9	1040	0111 0101
10	1120	0111 0111
11	1200	0111 1001
12	1280	0111 1011
13	1360	0111 1101
14	1440	0111 1111
15	1520	1000 0001
16	1600	1000 0011
17	1680	1000 0101
18	1760	1000 0111

CHANNEL		SWITCH POSITION
No.	CENTER FREQ.	1234 5678*
19	1840	1000 1001
20	1920	1000 1011
21	2000	1000 1101
22	2080	1000 1111
23	2160	1001 0001
24	2240	1001 0011
25	2320	1001 0101
26	2400	1001 0111
27	2480	1001 1001
28	2560	1001 1011
29	2640	1001 1101
30	2720	1001 1111
31	2800	1010 0001
32	2880	1010 0011
33	2960	1010 0101
34	3040	1010 0111
35	3120	1010 1001
36	3200	1010 1011
37	3280	1010 1101

80hz SEPARATION
±20hz SHIFT
50 BAUD

*NOTE: SWITCH POSITION 8 IS USED FOR PROGRAM SWITCH ASSEMBLY XP1 ONLY.

CHANNEL		SWITCH POSITION							
No.	CENTER FREQ.	1	2	3	4	5	6	7	8*
1	375	0	1	1	0	1	1	0	1
2	525	0	1	1	1	0	0	0	1
3	675	0	1	1	1	0	1	0	1
4	825	0	1	1	1	1	0	0	1
5	975	0	1	1	1	1	1	0	1
6	1125	1	0	0	0	0	0	0	1
7	1275	1	0	0	0	0	1	0	1
8	1425	1	0	0	0	1	0	0	1
9	1575	1	0	0	0	1	1	0	1
10	1725	1	0	0	1	0	0	0	1
11	1875	1	0	0	1	0	1	0	1
12	2025	1	0	0	1	1	0	0	1
13	2175	1	0	0	1	1	1	0	1
14	2325	1	0	1	0	0	0	0	1
15	2475	1	0	1	0	0	1	0	1
16	2625	1	0	1	0	1	0	0	1
17	2775	1	0	1	0	1	1	0	1
18	2925	1	0	1	1	0	0	0	1
19	3075	1	0	1	1	0	1	0	1
20	3225	1	0	1	1	1	0	0	1

*NOTE: SWITCH POSITION 8 IS USED FOR PROGRAM SWITCH ASSEMBLY XP1 ONLY.

150hz SEPARATION
±35hz SHIFT
75 BAUD

SERIES U

PROGRAM SHEET 6

No.	CHANNEL CENTER FREQ.	SWITCH POSITION 1 2 3 4 5 6 7 8*
1	425	0 1 0 1 1 1 1 1
2	595	0 1 1 0 0 0 1 1
3	765	0 1 1 0 0 1 1 1
4	935	0 1 1 0 1 0 1 1
5	1105	0 1 1 0 1 1 1 1
6	1275	0 1 1 1 0 0 1 1
7	1445	0 1 1 1 0 1 1 1
8	1615	0 1 1 1 1 0 1 1
9	1785	0 1 1 1 1 1 1 1
10	1955	1 0 0 0 0 0 1 1
11	2125	1 0 0 0 0 1 1 1
12	2295	1 0 0 0 1 0 1 1
13	2465	1 0 0 0 1 1 1 1
14	2635	1 0 0 1 0 0 1 1
15	2805	1 0 0 1 0 1 1 1
16	2975	1 0 0 1 1 0 1 1
17	3145	1 0 0 1 1 1 1 1
18	3315	1 0 1 0 0 0 1 1

*NOTE: SWITCH POSITION 8 IS USED FOR PROGRAM SWITCH ASSEMBLY XP1 ONLY.

170hz SEPARATION
±35hz SHIFT
110 BAUD

CHANNEL		SWITCH POSITION							
No.	CENTER FREQ.	1	2	3	4	5	6	7	8*
1	415	0	1	1	0	1	1	0	1
2	565	0	1	1	1	0	0	0	1
3	715	0	1	1	1	0	1	0	1
4	865	0	1	1	1	1	0	0	1
5	1015	0	1	1	1	1	1	0	1
6	1165	1	0	0	0	0	0	0	1
7	1315	1	0	0	0	0	1	0	1
8	1465	1	0	0	0	1	0	0	1
9	1615	1	0	0	0	1	1	0	1
10	1765	1	0	0	1	0	0	0	1
11	1915	1	0	0	1	0	1	0	1
12	2065	1	0	0	1	1	0	0	1
13	2215	1	0	0	1	1	1	0	1
14	2365	1	0	1	0	0	0	0	1
15	2515	1	0	1	0	0	1	0	1
16	2665	1	0	1	0	1	0	0	1
17	2815	1	0	1	0	1	1	0	1
18	2965	1	0	1	1	0	0	0	1
19	3115	1	0	1	1	0	1	0	1
20	3265	1	0	1	1	1	0	0	1

*NOTE: SWITCH POSITION 8 IS USED FOR PROGRAM SWITCH ASSEMBLY XP1 ONLY.

150hz SEPARATION
±45hz SHIFT
110 BAUD

SERIES Y

No.	CHANNEL CENTER FREQ.	SWITCH POSITION 1 2 3 4 5 6 7 8*
1	450	0 1 1 0 1 0 0 1
2	750	0 1 1 1 0 0 0 1
3	1050	0 1 1 1 1 0 0 1
4	1350	1 0 0 0 0 0 0 1
5	1650	1 0 0 0 1 0 0 1
6	1950	1 0 0 1 0 0 0 1
7	2250	1 0 0 1 1 0 0 1
8	2550	1 0 1 0 0 0 0 1
9	2850	1 0 1 0 1 0 0 1
10	3150	1 0 1 1 0 0 0 1

*NOTE: SWITCH POSITION 8 IS USED FOR PROGRAM SWITCH ASSEMBLY XP1 ONLY.

300hz SEPARATION
±80hz SHIFT
150 BAUD

SERIES B

CHANNEL		SWITCH POSITION							
No.	CENTER FREQ.	1	2	3	4	5	6	7	8*
1	595	0	1	1	0	0	0	1	1
2	935	0	1	1	0	1	0	1	1
3	1275	0	1	1	1	0	0	1	1
4	1615	0	1	1	1	1	0	1	1
5	1955	1	0	0	0	0	0	1	1
6	2295	1	0	0	0	1	0	1	1
7	2635	1	0	0	1	0	0	1	1
8	2975	1	0	0	1	1	0	1	1
9	3315	1	0	1	0	0	0	1	1

*NOTE: SWITCH POSITION 8 IS USED FOR PROGRAM SWITCH ASSEMBLY XP1 ONLY.

340hz SEPARATION
±85hz SHIFT
200 BAUD

SERIES K

CHANNEL No.	CENTER FREQ.	SWITCH POSITION 1 2 3 4 5 6 7 8*	
1	750	1 0 0 1 0 0 0 1	
2	1710	1 0 1 1 0 0 0 1	
3	2670	1 1 0 1 0 0 0 1	
1a	1290	1 0 1 0 0 0 1 1	RECOMMENDED FREQUENCIES WHEN ONLY 2 CHANNELS ARE REQUIRED.
2a	2250	1 1 0 0 0 0 1 1	

960hz SEPARATION
240hz SHIFT
600 BAUD

SERIES T

CHANNEL No.	CENTER FREQ.	SWITCH POSITION 1 2 3 4 5 6 7 8*
1	680	0 1 1 0 0 1 0 1
2	1020	0 1 1 0 1 1 0 1
3	1360	0 1 1 1 0 1 0 1
4	1700	0 1 1 1 1 1 0 1
5	2040	1 0 0 0 0 1 0 1
6	2380	1 0 0 0 1 1 0 1
7	2720	1 0 0 1 0 1 0 1
8	3060	1 0 0 1 1 1 0 1

*NOTE: SWITCH POSITION 8 IS USED FOR PROGRAM SWITCH ASSEMBLY XP1 ONLY.

340hz SEPARATION
±70hz SHIFT
200 BAUD

SPEED BPS	CODE STRUCTURE NO. OF BITS	SWITCH POSITION 1 2 3 4*
45.45	5	1 1 1 1
50.00	5	0 1 1 1
56.88	6	1 0 1 1
74.20	5	0 0 1 1
75.00	5	1 1 0 1
110.00	8	0 1 0 1
134.4	7	1 0 0 1
150.0	8	0 0 0 1

*NOTE: SET SWITCH POSITION 4 to "0" WHEN USING AN EXTERNAL CLOCK.

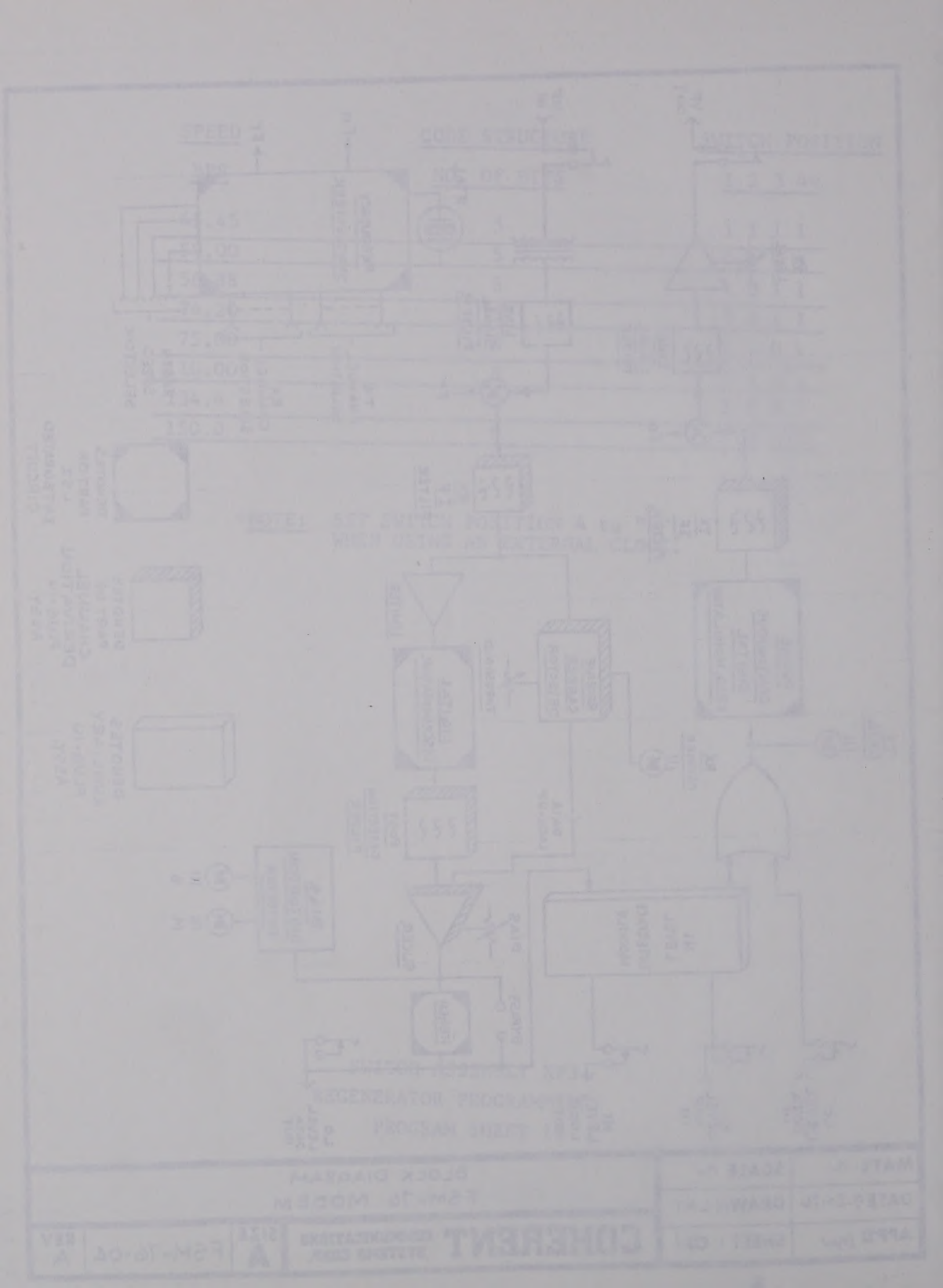
SWITCH ASSEMBLY XP3
REGENERATOR PROGRAMMING
PROGRAM SHEET 12

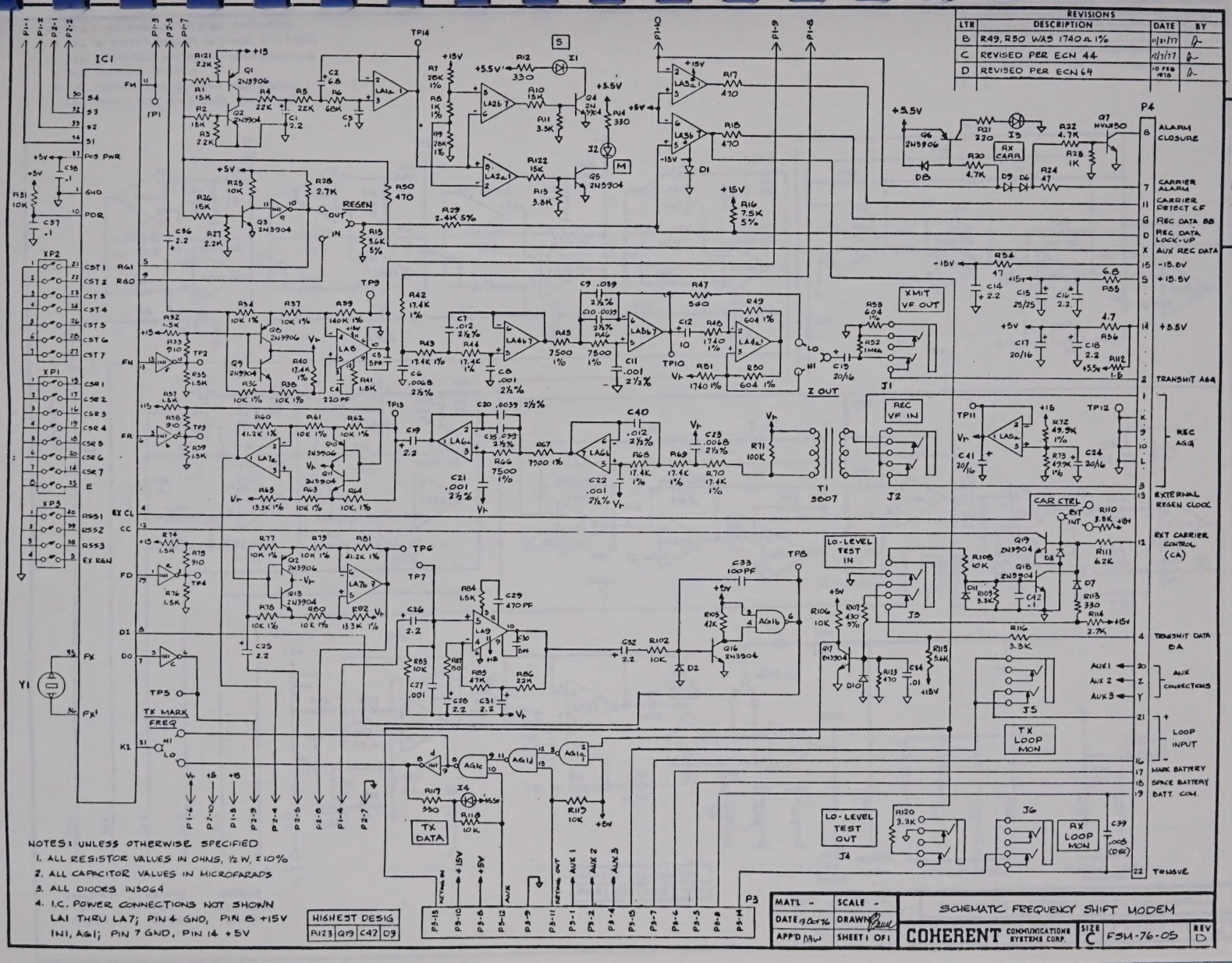
MAT'L ~	SCALE ~
DATE 9-20-76	DRAWN LAT
APP'D BW	SHEET 1 OF 1

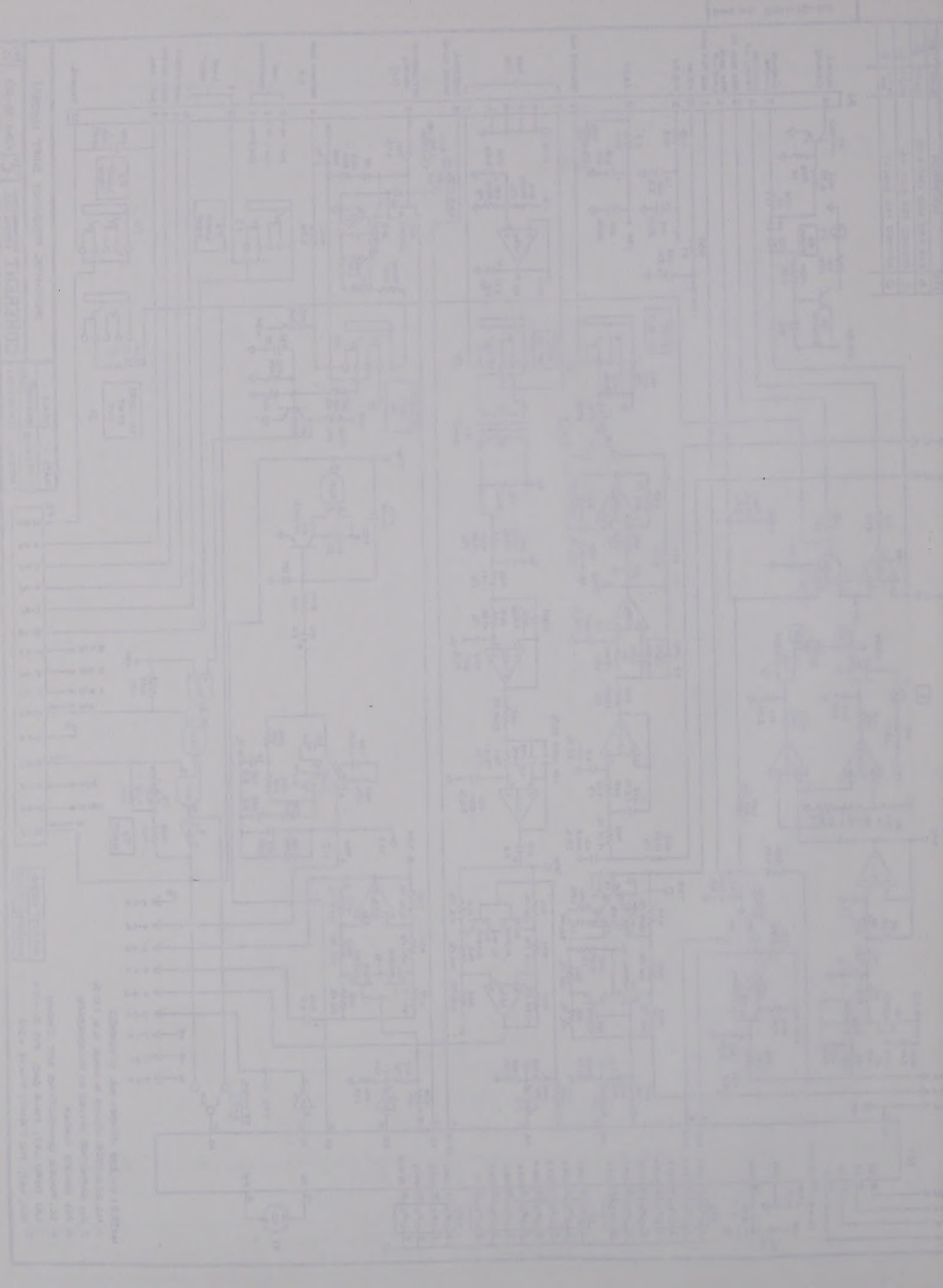
BLOCK DIAGRAM
FSM-76 MODEM

COHERENT COMMUNICATIONS SYSTEMS CORP.

SIZE		REV
A	FSM-76-04	A



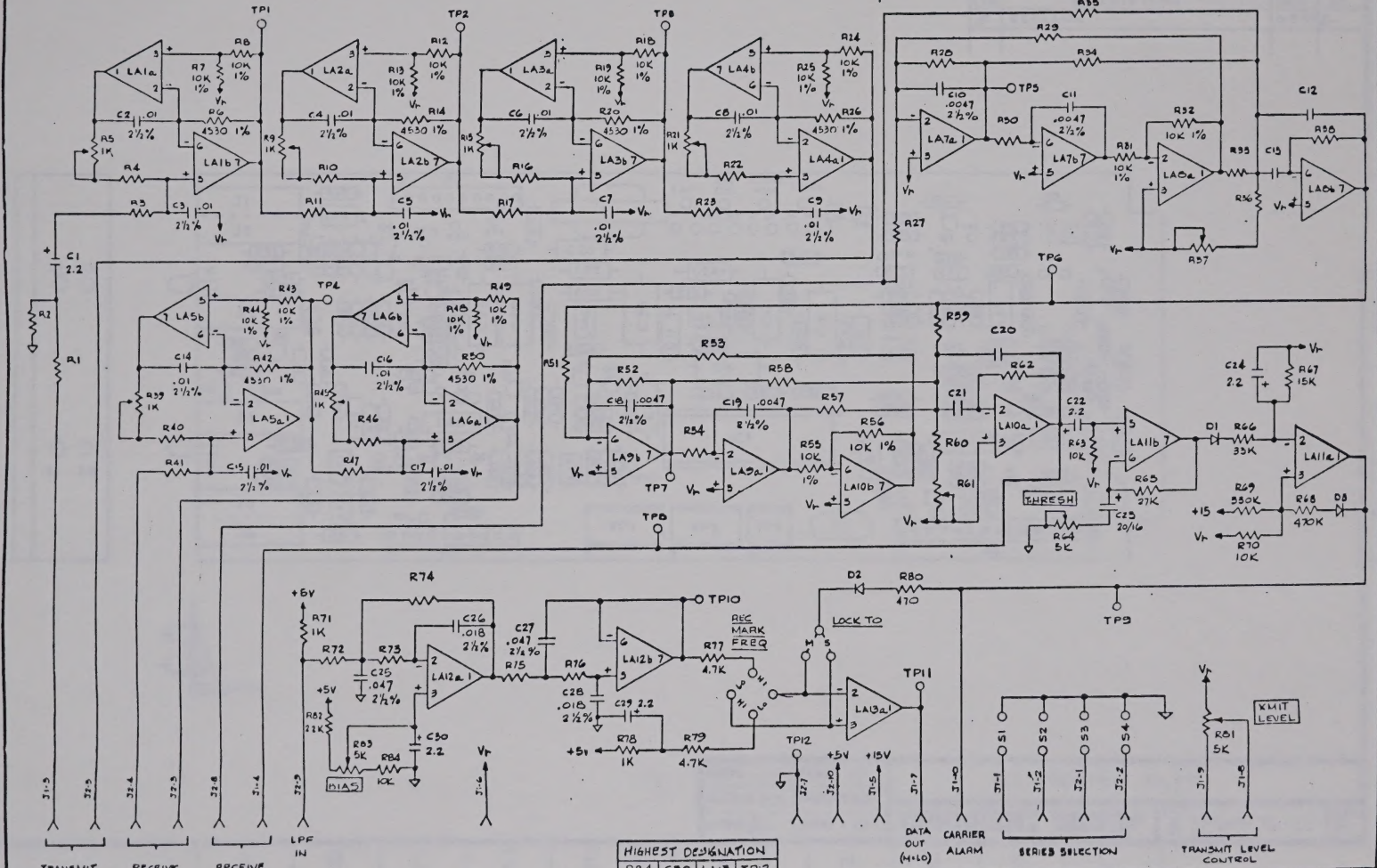

REVISIONS
LTR | DESCRIPTION | DATE | BY
B | R49, R50 WAS 1740 Δ 1% | 11/21/77 | D-
C | REVISED PER ECN 44 | 12/1/77 | D-
D | REVISED PER ECN 64 | 10 FEB 1978 | D-
DWG. NO. FSM-76-05
IC1
XP2
XP1
XP3
P4
P3
P1-1
P1-2
P2-1
P2-2
P1-3
P2-3
P1-7
TP14
P1-10
P1-9
P1-8
+15
+5.5V
+5V
-15V
+8V
S
M
I1
I2
I3
I4
Q1 2N3906
Q2 2N3904
Q3 2N3904
Q4 2N3904
Q5 2N3904
Q6 2N3906
Q7 MV5050
Q8 2N3906
Q9 2N3904
Q10 2N3906
Q11 2N3904
Q12 2N3904
Q13 2N3904
Q16 2N3904
Q17 2N3904
Q18 2N3904
Q19 2N3904
D1
D2
D7
D8
D9
D10
D11
DB
R1 15K
R2 15K
R3 2.2K
R4 22K
R5 22K
R6 68K
R7 26K 1%
R8 1K 1%
R9 26K 1%
R10 13K
R11 3.5K
R12 330
R13 3.8K
R14 330
R15 3.6K 5%
R16 7.5K 5%
R17 470
R18 470
R20 4.7K
R21 270
R22 4.7K
R23 470
R24 47
R25 10K
R26 15K
R27 2.2K
R28 2.7K
R29 2.4K 5%
R30 470
R31 10K
R32 1.5K
R33 910
R34 10K 1%
R35 1.5K
R36 10K 1%
R37 10K 1%
R38 10K 1%
R39 140K 1%
R40 17.4K 1%
R41 1.8K
R42 17.4K 1%
R43 17.4K 1%
R44 17.4K 1%
R45 7500 1%
R46 7500 1%
R47 590
R48 1740 1%
R49 604 1%
R50 604 1%
R51 1740 1%
R52 604 1%
R53 604 1%
R54 47
R55 6.8
R56 4.7
R57 1.8K
R58 910
R59 1.5K
R60 41.2K 1%
R61 10K 1%
R62 10K 1%
R63 10K 1%
R64 10K 1%
R65 13.3K 1%
R66 7500 1%
R67 7500 1%
R68 17.4K 1%
R69 17.4K 1%
R70 17.4K 1%
R71 100K
R72 49.9K 1%
R73 499K 1%
R74 1.5K
R75 910
R76 1.5K
R77 10K 1%
R78 10K 1%
R79 10K 1%
R80 10K 1%
R81 41.2K 1%
R82 13.3K 1%
R83 10K
R84 1.5K
R85 47K
R86 22K
R87 150
R88 10K
R89 10K
R90 470
R91 10K
R92 1.5K
R93 10K
R94 10K
R95 10K
R96 10K
R97 430 1%
R98 10K
R99 3.3K
R100 10K
R101 3.3K
R102 10K
R103 2.6K
R104 470
R105 47K
R106 10K
R107 430 1%
R108 10K
R109 3.3K
R110 3.8K
R111 6.2K
R112 1.8
R113 330
R114 2.7K
R115 2.6K
R116 3.3K
R117 330
R118 10K
R119 10K
R120 3.3K
C1 2.2
C2 6.8
C3 .1
C4 220 PF
C5 5PF
C6 .0068 2½%
C7 .012 2½%
C8 .001 2½%
C9 .039 2½%
C10 .0039 2½%
C11 .001 2½%
C12 10
C13 20/16
C14 2.2
C15 25/25
C16 2.2
C17 20/16
C18 2.2
C19 2.2
C20 .0039 2½%
C21 .001 2½%
C22 .001 2½%
C23 .0068 2½%
C24 20/16
C25 2.2
C26 2.2
C27 .001
C28 2.2
C29 470 PF
C30 5PF
C31 2.2
C32 2.2
C33 100PF
C34 .01
C35 .0039 2½%
C36 .1
C37 .1
C38 .1
C39 .005 (DGR)
C40 .012 2½%
C41 20/16
C42 .1
T1 3607
Y1
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10
TP11
TP12
TP13
J1
J2
J3
J4
J5
J6
REGEN
IN
OUT
XMIT VF OUT
Z OUT
REC VF IN
LO-LEVEL TEST IN
LO-LEVEL TEST OUT
CAR CTRL
TX LOOP MON
RX LOOP MON
TX DATA
TX MARK FREQ
RX CARR
ALARM CLOSURE
CARRIER ALARM
CARRIER DETECT CF
REC DATA BB
REC DATA LOCK-UP
AUX REC DATA
-15.8V
+15.5V
+5.5V
TRANSMIT ASG
REC ASG
EXTERNAL REGEN CLOCK
EXT CARRIER CONTROL (CA)
TRANSMIT DATA DA
AUX CONNECTIONS
LOOP INPUT
MARK BATTERY
SPACE BATTERY
BATT. COM.
TONGUE
P1-4
P2-10
P1-5
P2-9
P2-4
P2-5
P2-6
P1-6
P2-7
P3-15
P3-10
P3-6
P3-12
P3-9
P3-11
P3-1
P3-2
P3-4
P3-15
P3-7
P3-6
P3-5
P3-8
P3-14
KEYING IN
KEYING OUT
AUX 1
AUX 2
AUX 3
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTOR VALUES IN OHMS, ½ W, ±10%
2. ALL CAPACITOR VALUES IN MICROFARADS
3. ALL DIODES IN5064
4. I.C. POWER CONNECTIONS NOT SHOWN
LA1 THRU LA7; PIN 4 GND, PIN 8 +15V
IN1, AG1; PIN 7 GND, PIN 14 +5V
HIGHEST DESIG
R123 G19 C42 D9
MAT'L -
SCALE -
DATE 19 Oct 76
DRAWN
APP'D
SHEET 1 OF 1
SCHEMATIC FREQUENCY SHIFT MODEM
COHERENT COMMUNICATIONS SYSTEMS CORP.
SIZE C
FSM-76-05
REV D



NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTOR VALUES IN OHMS, ½W, ± 10%
2. ALL CAPACITOR VALUES IN MICROFARADS
3. ALL DIODES IN3064
4. I.C. POWER CONNECTION NOT SHOWN
   LA1 THRU LA13; PIN 4 GND, PIN 8 +15

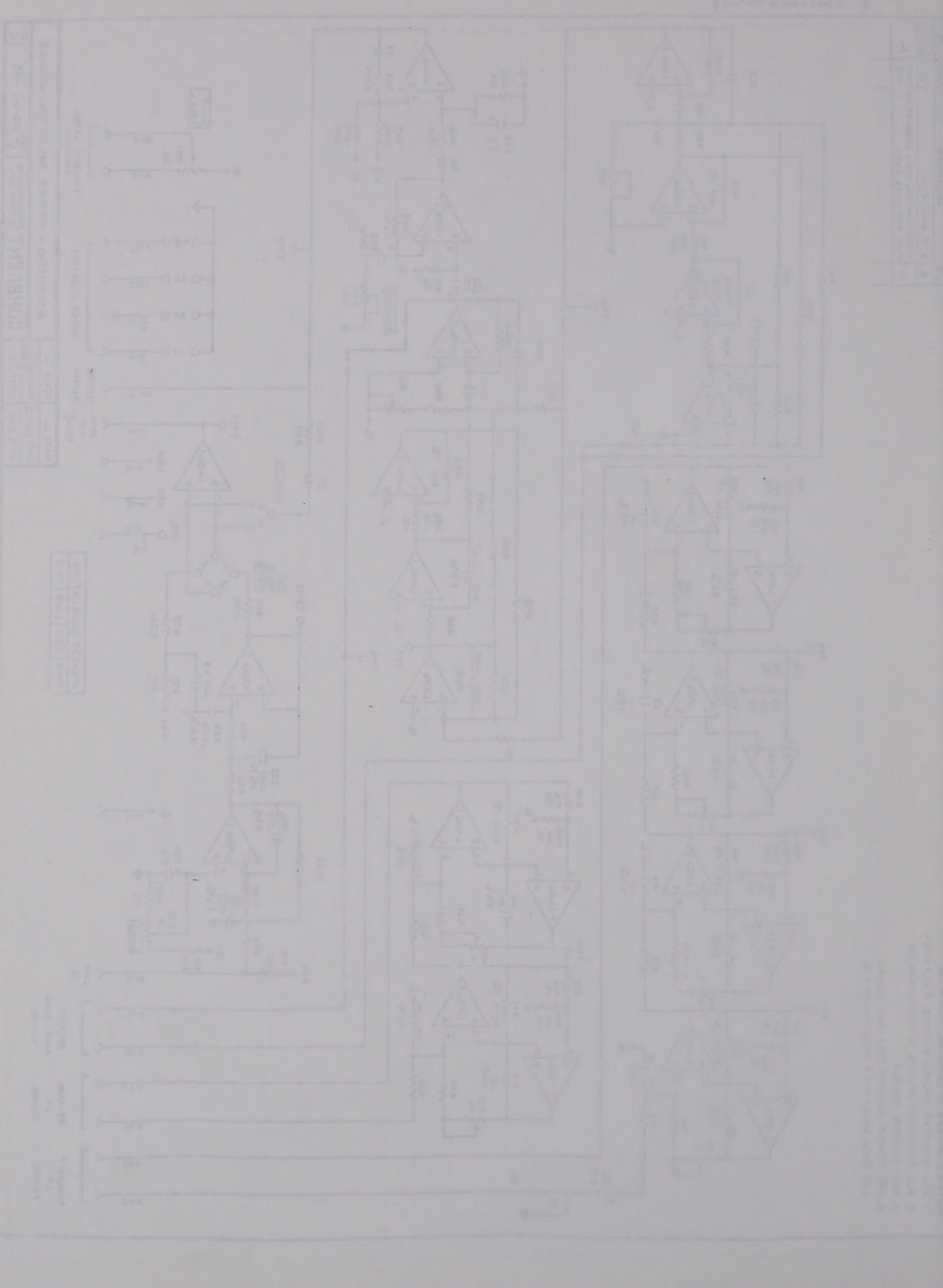
REVISIONS			
LTR	DESCRIPTION	DATE	BY
B	R78 WAS 47Ω	9/3/77	A
C	INTERCHANGED HI/LO DESIGNATION FOR REC MARK FREQ	11 MAR 1978	A

DWG NO. CDN-1-05

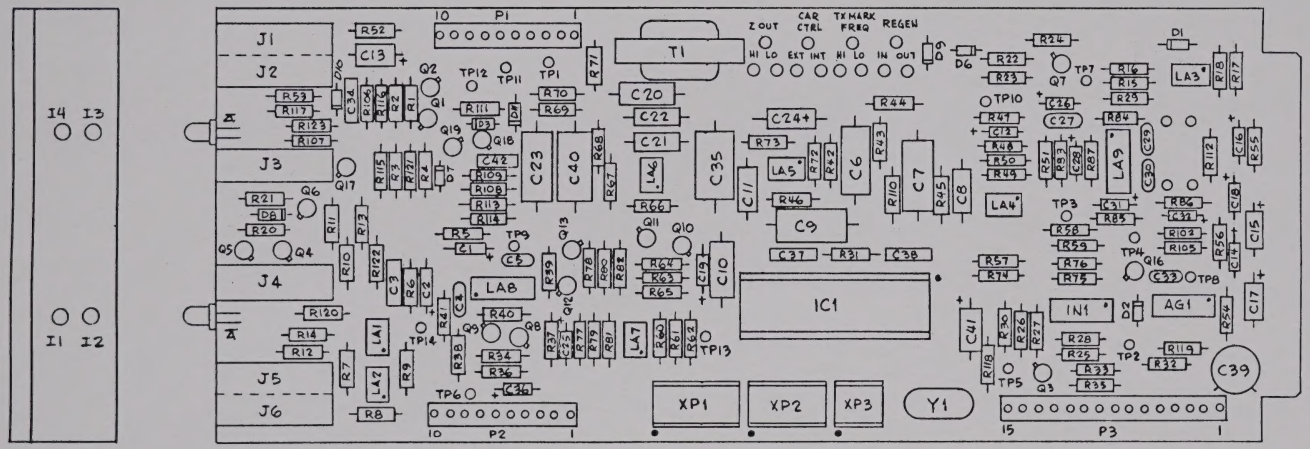


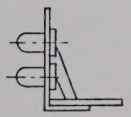
HIGHEST DESIGNATION			
R84	C30	LA13	TP12

MAT'L —	SCALE —	SCHEMATIC - SERIES SELECTION MODULE	
DATE 9/28/76	DRAWN		
APP'D	SHEET 1 OF 1	COHERENT COMMUNICATIONS SYSTEMS CORP.	SIZE C · CDN-1-05 · REV C



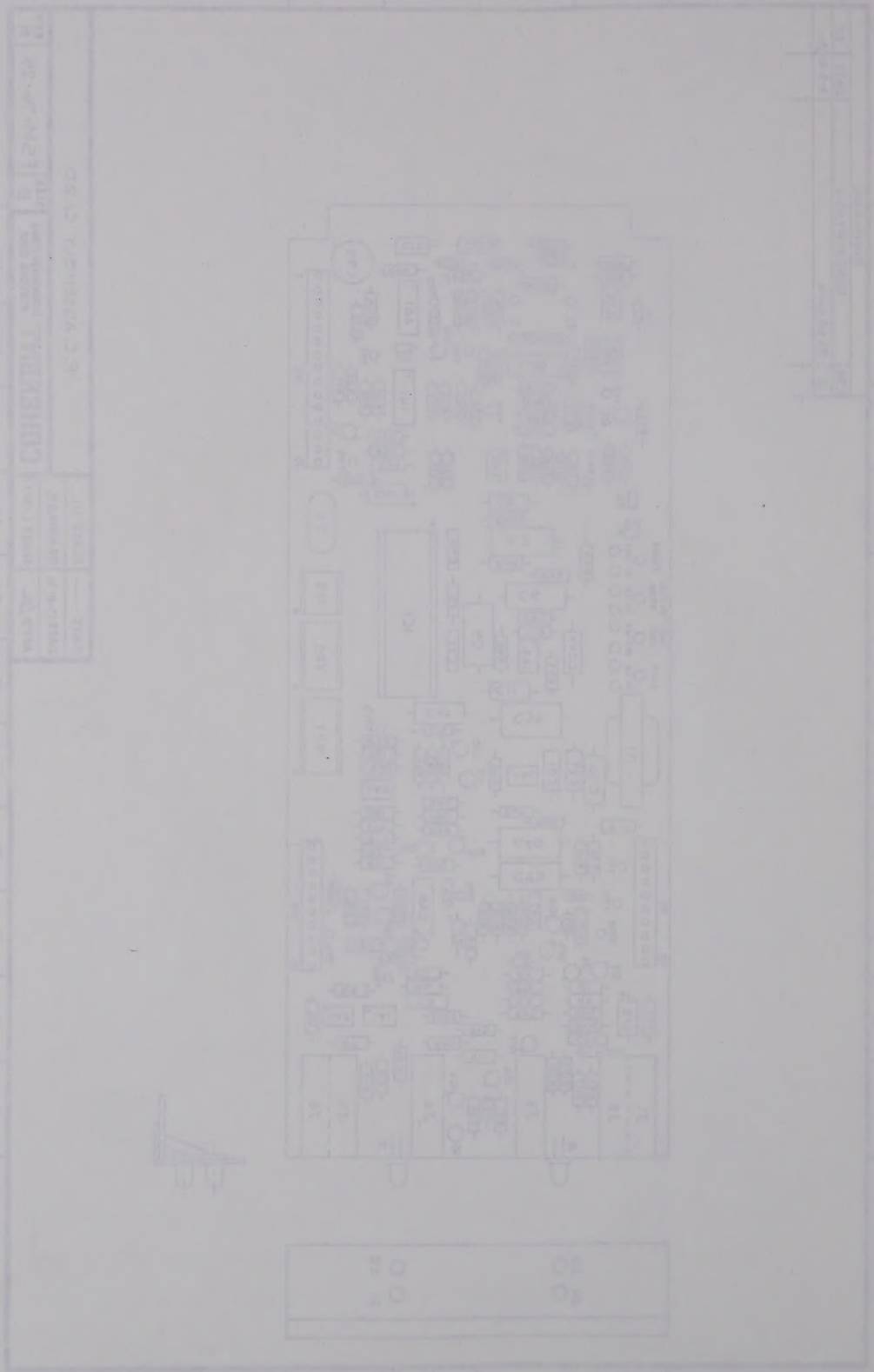
REVISIONS			
LTR	DESCRIPTION	DATE	BY
F	REDRAWN	5-3-80	





MAT'L ——	SCALE 1/1	P.C. ASSEMBLY CARD	
DATE 10-8-76	DRAWN GB		
APP'D	SHEET 1 OF 1	COHERENT COMMUNICATIONS SYSTEMS CORP.	SIZE B — FSM-76-25 — REV G

BRUNING 40-530 42730



INSTRUCTION MANUAL

INTERFACE CARD

MODEL LPD-7A
ISSUE III

COHERENT COMMUNICATIONS SYSTEMS CORP.
60 COMMERCE DRIVE
Hauppauge, New York 11788
TELEPHONE: (516) 231-1550
(718) 895-6316

Cable Address: COHERENT, HAUPPAUGE
Telex: RCA 221513
WU 96-1439

EQUIPMENT WARRANTY

Coherent Communications Systems Corporation warrants equipment sold by it to be free from defects in material and workmanship under normal use and service for a period of twelve (12) months after installation or eighteen (18) months after date of delivery, whichever shall occur first.

The obligation of Coherent hereunder is limited to repair and/or replacement of any defective part or parts, provided the same are returned, transportation and insurance charges prepaid to the nearest authorized representative within the period of this warranty.

The express warranty made herein shall not be effective if the equipment has been modified without factory authorization or has been subject to misuse, abuse or lack of reasonable care in its use.

In no event shall Coherent be responsible for consequential damages in connection with equipment sold by it.

INTERFACE CARD

MODEL LPD-7A

INSTRUCTION MANUAL

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SCHEMATIC DIAGRAM:	Drawing Number
INTERFACE CARD	B LPD-7A-05
ASSEMBLY DRAWING:	
P.C. ASSEMBLY	A LPD-7A-25

CHAPTER 1

GENERAL DESCRIPTION

1.0 INTRODUCTION

1.01 The Coherent Communications Systems Corp. Interface Card, Model LPD-7A is a completely solid state module. This module is designed to interface high level current loops with low level binary input and output circuitry in Coherent modems.

1.02 The LPD-7A module interfaces high level current loops that use polar or 20mA/60mA neutral signals.

1.03 Positive or Negative Mark Polar and 20mA/60mA Neutral operations are strap selected. Full or Half Duplex options are also strap selected.

1.04 All input and output signals are routed via the LPD-7A connector P1 as shown in Table 1.

1.05 Table 2 shows the electrical and mechanical specifications of the LPD-7A Interface Card.

TABLE 1

CONNECTOR P1 DESIGNATIONS

PIN	FUNCTION
15	TRANSMIT LOOP IN, POSITIVE
7	TRANSMIT LOOP IN, NEGATIVE
11	TRANSMIT LOW LEVEL KEYING OUT
13	RECEIVE LOW LEVEL KEYING IN
6	a. POSITIVE RECEIVE LOOP BATTERY IN (POLAR OPERATION AND NEUTRAL POSITIVE MARK OPERATION)
	b. NEGATIVE RECEIVE LOOP BATTERY IN (NEUTRAL NEGATIVE MARK OPERATION ONLY)
5	NEGATIVE RECEIVE LOOP BATTERY IN (POLAR OPERATION)
14	RECEIVE LOOP OUT, TONGUE
8	POSITIVE 5VDC INPUT
9	GROUND INPUT
1-4 10 11	NOT USED

TABLE 2	
SPECIFICATIONS	
A. GENERAL	
EQUIPMENT POWER REQUIREMENT	+5VDC @ 15 mA (DERIVED FROM THE CORRESPONDING MODEM
B. TRANSMIT INPUT SECTION	
OPERATING MODES	HIGH LEVEL CURRENT LOOP, POLAR OR NEUTRAL 20mA/60m OPERATION. STRAP SELECTED.
CURRENT LIMITING	NONE, MUST BE EXTERNALLY PROVIDED.
C. RECEIVE OUTPUT SECTION	
OPERATING MODES	HIGH LEVEL CURRENT LOOP, POLAR OR NEUTRAL OPERATIO POSITIVE OR NEGATIVE MARK.
CURRENT LIMITING	NONE, MUST BE EXTERNALLY PROVIDED.
REQUIRED LOOP BATTERY VOLTAGES	±15VDC TO ±130VDC FOR POLAR OPERATION. 15 TO 260VDC FOR NEUTRAL OPERATION.
OPERATING SPEED	UP TO 300BPS.
D. PHYSICAL CHARACTERISTICS	
TEMPERATURE RANGE	0°C to +50° OPERATING -20°C to +80°C STORAGE
SIZE	2-7/8" (72mm) x 4-3/8" (105mm) x 5/8" (15mm)
WEIGHT	1.5oz. (43g)
CONSTRUCTION	SINGLE GLASS EPOXY PLUG-ON BOARD.
INTERFACE CONNECTIONS	ALL CONNECTIONS ARE MADE VIA A 15 PIN MOLEX CONNECTOR P1.

CHAPTER 2

FUNCTIONAL DESCRIPTION

1.0 TRANSMIT CIRCUIT

1.01 Refer to Schematic Diagram LPD-7A-05 and Assembly Drawing, LPD-7A-25.

1.02 The high level transmit current loop is brought into the LPD-7A connector P1, pins 15 (+) and 7 (-) called LOOP IN, via the Modem "Auxiliary Card" connector.

1.03 The transmit current loop is terminated in the opto-isolator input circuit, consisting of resistors R1,R2,R3, steering diodes D1,D2 and opto-isolator OI-1. The opto-isolator provides isolation between the current loop and the LPD-7A low level keying out circuit. Straps A,B and C furnish Polar, Neutral 20mA and Neutral 60mA transmit current loop input options.

1.04 Low level binary signals, suitable to drive the modem transmit input circuit, are derived from the output of OI-1, transistors Q1,Q2 and associated circuitry.

1.05 The low level output of the LPD-7A module, called KEYING OUT, is brought from the LPD-7A connector P1, pin 11 to the modem circuitry via the "Auxiliary Card" connector.

2.0 RECEIVE CIRCUIT, POLAR OR POSITIVE MARK NEUTRAL OPERATION

2.01 Refer to Schematic Diagram LPD-7A-05 and Assembly Drawing LPD-7A-25.

2.02 Received low level binary signals brought into the LPD-7A module via connector P1, pin 13, drive transistor Q3.

2.03 The output of transistor Q3 drives inverters IN1f, IN1e and IN1d via strap "E" for Polar, positive mark operation. This strap is also inserted for Neutral operation.

2.04 When strap "D" is made the inverter IN1e is bypassed resulting in Polar negative mark receive loop output signals.

2.05 During marking condition (low on connector P1, pin 13) transistor Q3 is turned off causing the inverter IN1d output to be low when strap "E" is inserted.

2.06 Opto-isolator OI-2 is off when a low is present at the inverter IN1d output. When OI-2 is off, transistors Q4 and Q5 turn on and conduct, which provides a path for positive loop battery from connector P1, pin 6 (+). This path is via transistor Q5 to connector P1, pin 14 (T). Transistors Q6 and Q7 are off.

2.07 Opto-isolator OI-2 is turned on by a high (+) output from inverter IN1d. When OI-2 is on, transistors Q4 and Q5 turn off and transistors Q6 and Q7 turn on to provide a path for negative loop battery. The negative loop battery path is brought from connector P1, pin 5 (-) via transistor Q7 and strap "G" to connector P1, pin 14 (T) during polar operation.

2.08 The negative or positive Polar mark output option is determined by selection of strap "E" (positive mark) or "D" (negative mark).

2.09 For Neutral positive mark operation strap "G" is not made and strap "E" is inserted. Positive loop battery is applied to connector P1, pin 6 (+).

3.0 RECEIVE CIRCUIT, NEGATIVE MARK, NEUTRAL OPERATION

3.01 Refer to Schematic Diagram LPD-7A-05 and Assembly Drawing LPD-7A-25.

3.02 Note that the NEGATIVE loop battery is connected to pin 6 (+) of the LPD-7A connector P1 when operating in this mode.

3.03 Receive low level signals into the LPD-7A module are brought via transistor Q3, inverters IN1f, IN1e and IN1d, with strap "E" inserted, to opto-isolator OI-2 as described in paragraphs 2.02, 2.03 and 2.05 in this chapter.

3.04 When OI-2 is off transistors Q4 and Q5 conduct and provide a path for negative loop battery from connector PI, pin 6 called (+) M. This connector pin is otherwise used for positive loop battery when Polar or Neutral positive mark modes are selected.

3.05 The Neutral negative loop battery path is via diodes D10 and D11, transistor Q5 and diodes D9,D8,D6 and strap "F" to connector P1, pin 14 (T).

3.06 Note that strap "G" is NOT made and that loop battery is not applied to connector P1, pin 5. This connector pin is otherwise used for negative loop battery when operating in Polar mode.

4.0 HALF DUPLEX OPERATION

4.01 Refer to Schematic Diagram LPD-7A-05 and Assembly Drawing LPD-7A-25.

4.02 Half Duplex operation is provided through insertion of strap "I" This strap inhibits transistor Q1 by holding it in the marking state during received spacing conditions from connector P1, pin 13 "KEYING IN". If this were not the case, spacing signals would be retransmitted to the distant end and the system would "lock up" in the spacing condition.

4.03 Note that when Half Duplex mode is used the circuit must be operated using neutral signals.

TABLE 3	
STRAPPING, TRANSMIT SECTION	
STRAP	FUNCTION
A	TRANSMIT LOOP IN, POLAR OPERATION
B	TRANSMIT LOOP IN, 20mA NEUTRAL OPERATION
C	TRANSMIT LOOP IN, 60mA NEUTRAL OPERATION

TABLE 4	
STRAPPING, RECEIVE SECTION, POLAR POSITIVE MARK OPERATION	
STEP	DESCRIPTION
1	CHECK RECEIVE LOOP BATTERY CONNECTIONS, POSITIVE LOOP BATTERY MUST BE APPLIED TO THE LPD-7A CONNECTOR P1, PIN 6 AND NEGATIVE TO PIN 5.
2	INSERT STRAP "E"
3	INSERT STRAP "G"

TABLE 5	
STRAPPING, RECEIVE SECTION, POLAR NEGATIVE MARK OPERATION	
STEP	
1	CHECK RECEIVE LOOP BATTERY CONNECTIONS. POSITIVE LOOP BATTERY MUST BE APPLIED TO THE LPD-7A CONNECTOR P1, PIN 6 AND NEGATIVE TO PIN 5.
2	INSERT STRAP "D"
3	INSERT STRAP "G"

1.0 CONNECTIONS

1.01 Refer to Schematic Diagram LPD-7A-05.

1.02 A 15 pin Molex connector (P1) provides both input and output terminations. The P1 pin identifications are listed in Table 1 on page 1-1. Note that all inputs and outputs are derived from or routed via the Modem "Auxiliary Card" connector.

2.0 STRAPPING

2.01 Refer to Schematic Diagram LPD-7A-05 and Assembly Drawing LPD-7A-25.

2.02 Check strapping for the desired operating mode prior to plugging the LPD-7A module on to the corresponding Modem.

2.03 Refer to Table 3 for transmit section strapping. Note that Transmit Loop In marking polarities must be connected as shown on Schematic Diagram LPD-7A-05.

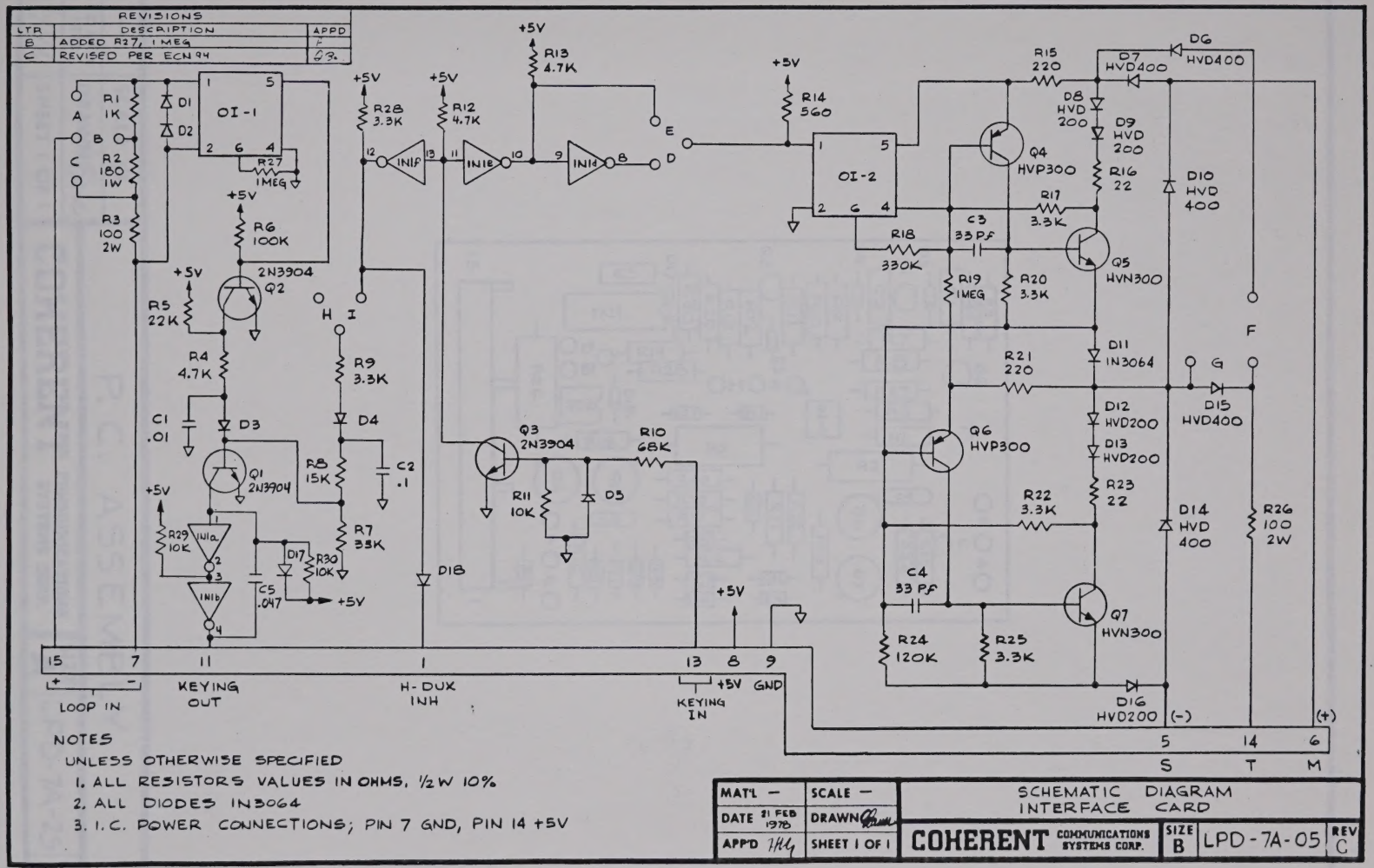
2.04 Refer to Tables 4 through 7 for LPD-7A receive section strapping instructions.

TABLE 6	
STRAPPING, RECEIVE SECTION, NEUTRAL POSITIVE MARK OPERATION	
STEP	DESCRIPTION
1	CHECK RECEIVE LOOP BATTERY CONNECTIONS. POSITIVE LOOP BATTERY MUST BE APPLIED TO THE LPD-7A CONNECTOR P1, PIN 6. PIN 5 REMAINS OPEN.
2	INSERT STRAP "E".
3	INSERT STRAP "F".
4	INSERT STRAP "I" FOR HALF DUPLEX OPERATION ONLY.

TABLE 7	
STRAPPING, RECEIVE SECTION, NEUTRAL NEGATIVE MARK OPERATION	
STEP	DESCRIPTION
1	CHECK RECEIVE LOOP BATTERY CONNECTIONS. NEGATIVE LOOP BATTERY MUST BE APPLIED TO THE LPD-7A CONNECTOR P1, PIN 6. PIN 5 REMAINS OPEN.
2	INSERT STRAP "E"
3	INSERT STRAP "F".
4	INSERT STRAP "I" FOR HALF DUPLEX OPERATION ONLY.

3.0 INSTALLATION

3.01 To install, plug the Interface Card LPD-7A onto the Modem "Auxiliary Card" connector. Orient the LPD-7A so that the component side is away from the Modem module.



NOTES

UNLESS OTHERWISE SPECIFIED

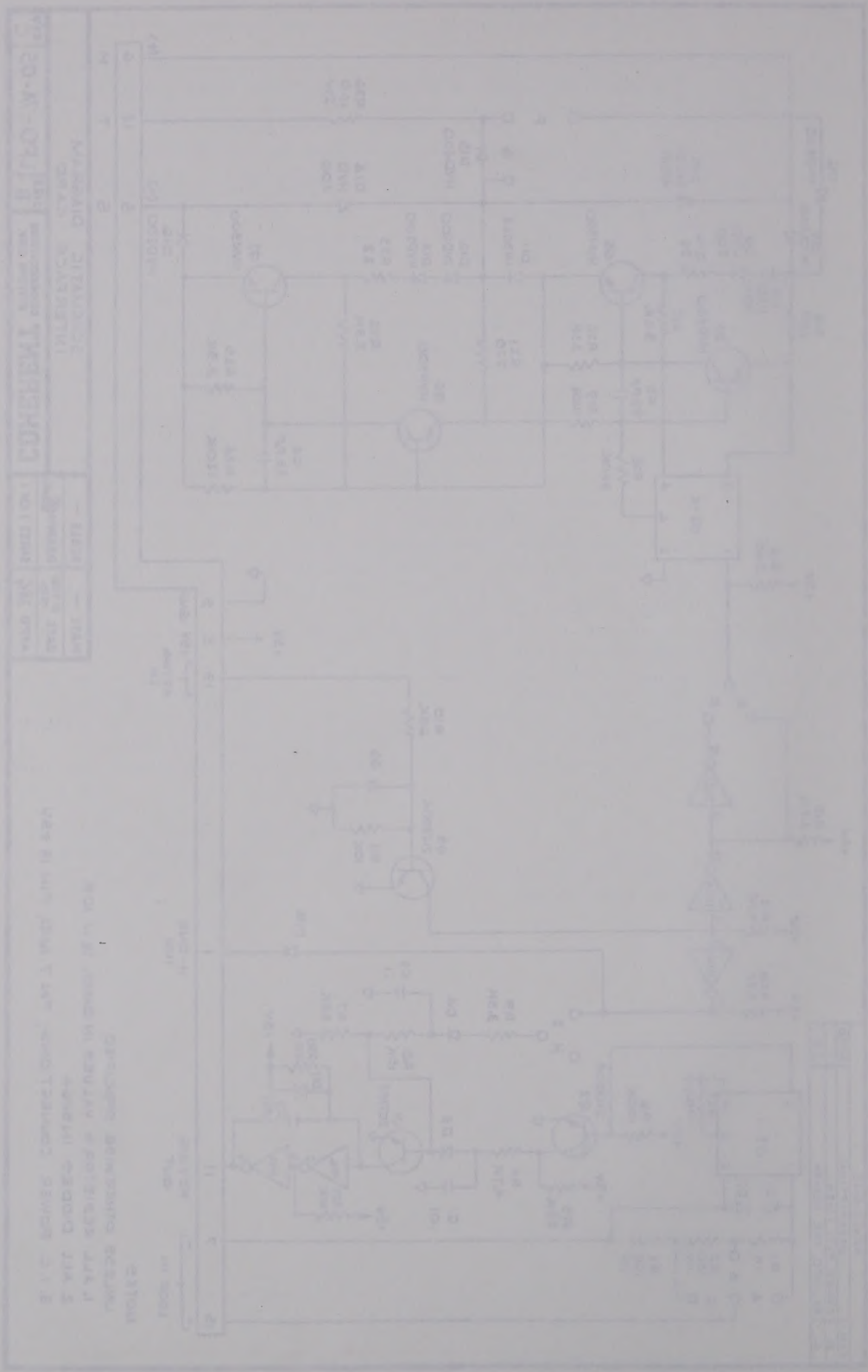
1. ALL RESISTORS VALUES IN OHMS, ½W 10%
2. ALL DIODES IN3064
3. I.C. POWER CONNECTIONS; PIN 7 GND, PIN 14 +5V

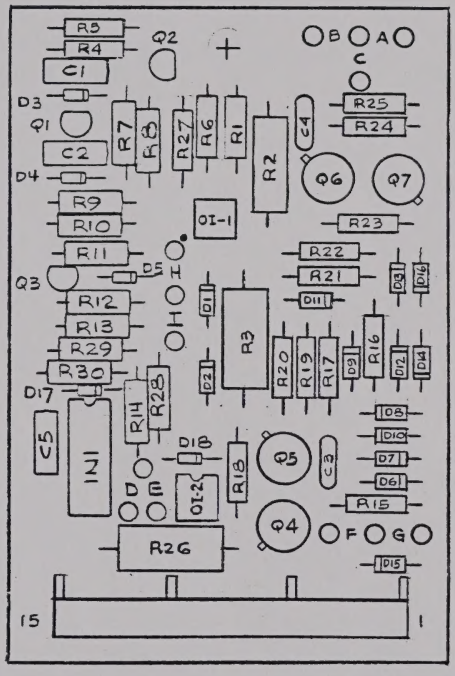
MAT'L —	SCALE —
DATE 21 FEB 1978	DRAWN
APP'D	SHEET 1 OF 1

SCHEMATIC DIAGRAM
INTERFACE CARD

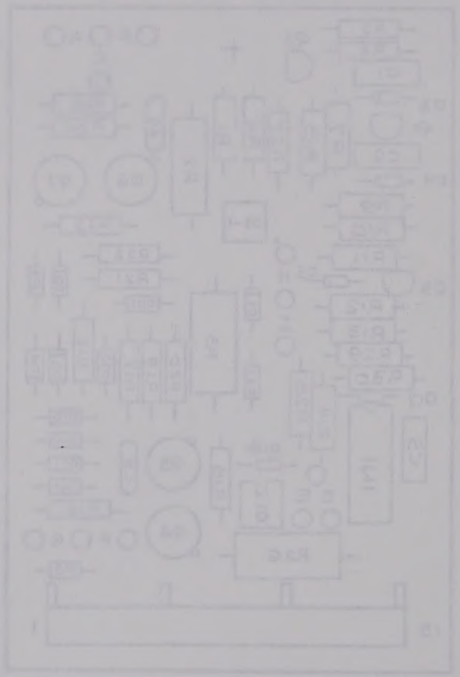
COHERENT COMMUNICATIONS SYSTEMS CORP.

SIZE B | LPD-7A-05 | REV C





MAT'L —	SCALE 1/1	P. C. ASSEMBLY			
DATE 22 FEB 1978	DRAWN				
APP'D	SHEET 1 OF 1	COHERENT COMMUNICATIONS SYSTEMS CORP.	SIZE A	LPD-7A-25	REV C



INSTRUCTION MANUAL

EQUIPMENT POWER SUPPLY

MODEL EQP-71B

COHERENT COMMUNICATIONS SYSTEMS CORP.
60 COMMERCE DRIVE
Hauppauge, New York 11788
TELEPHONE: (516) 231-1550
(718) 895-6316

Cable Address: COHERENT, HAUPPAUGE
Telex: RCA 221513
WU 96-1439

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EQUIPMENT POWER SUPPLY

MODEL EQP-71B

INSTRUCTION MANUAL

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	DRAWING NUMBER
SCHEMATIC DIAGRAM	
EQUIPMENT POWER SUPPLY	B EQP-71B-05
ASSEMBLY DIAGRAM	
PC BOARD ASSEMBLY	B EQP-71B-25

CHAPTER 1

GENERAL DESCRIPTION

1.0 DESCRIPTION

1.01 The Coherent Communications Equipment Power Supply Model EQP-71B is designed to furnish multiple DC output voltages from 10.5VAC and 21.0VAC input voltages. These inputs are normally supplied from an external transformer. The DC outputs are +5.5VDC, +15.5VDC and -15VDC. The +5.5VDC and +15.5VDC supply sections are regulated. The -15VDC supply section, which derives its input from the +15.5VDC section, is unregulated.

1.02 The EQP-71B power supply is contained on a single glass epoxy printed circuit board, which is designed to mount in an EQH-8() series equipment housing.

1.03 Two front-panel mounted LED pilot lamps are provided to indicate presence or loss of AC or DC voltages.

1.04 The red LED pilot lamp inidcates presence of the 10.5VAC input voltage. Presence of +5.5VDC, +15.5VDC and -15VDC output voltages is indicated when the green LED pilot lamp is on.

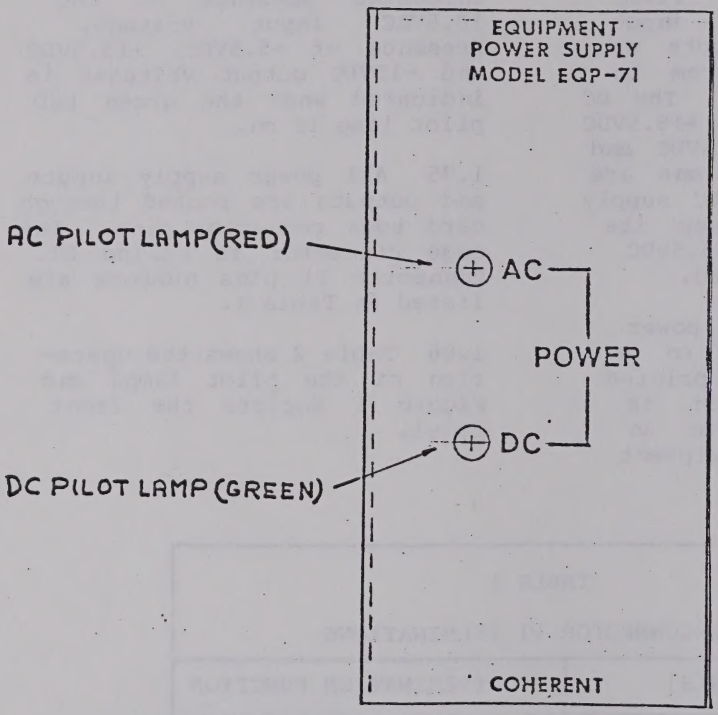
1.05 All power supply inputs and outputs are routed through card edge connector pins. The edge connector is called P1. Connector P1 pins numbers are listed in Table 1.

1.06 Table 2 shows the operation of the pilot lamps and Figure 1 depicts the front panel.

TABLE 1

EDGE CONNECTOR P1 TERMINATIONS

P1 PIN(S)	TERMINATION FUNCTION
17 18	INPUT, 10.5VAC
3 4	INPUT, 21.0VAC
13 14	OUTPUT, +5.5VDC
5 6	OUTPUT, +15.5VDC
15	OUTPUT, -15VDC
9 10 11	OUTPUT, GROUND



EQP-71B FRONT PANEL

CHAPTER 2

FUNCTIONAL DESCRIPTION

1.0 POSITIVE 5.5VDC OUTPUT SECTION

1.01 Refer to Schematic Diagram EQP-71B-05.

1.02 Edge connector P1, pins 17 and 18 provide the 10.5VAC input termination for the +5.5VDC power supply section. Diodes D2-D5 furnish rectification for the voltage regulator, VR1 input.

1.03 Voltage regulator VR1 furnishes regulation for the +5.5VDC output, which is terminated on edge connector P1, pins 13 and 14.

2.0 POSITIVE 15.5VDC OUTPUT SECTION

2.01 Refer to Schematic Diagram EQP-71B-05.

2.02 Edge connector P1, pins 3 and 4 provide the 21.0VAC input termination for the +15.5VDC power supply section, while diodes D11-D14 furnish rectification.

2.03 Amplifiers LA1a and LA1b together with transistors Q3, Q4, Q7 and associated circuitry, provide +15.5VDC regulation. The 1K potentiometer R20 is used to adjust the +15.5VDC output, which is brought to edge connector P1, pins 5 and 6.

3.0 NEGATIVE 15VDC OUTPUT SECTION

3.01 Refer to Schematic Diagram EQP-71B-05.

3.02 The -15VDC power supply section derives its input voltage from the +15.5VDC power supply section output.

3.03 Positive 15.5VDC is applied to IC1, which functions as a 20KHz oscillator alternately driving transistors Q1 and Q2 to saturation. Capacitor C9, together with diodes D9 and D10 rectify the output of the Q1, Q2 junction. The -15VDC output is terminated in edge connector P1, pin 15.

3.04 The DC pilot lamp circuit is comprised of transistors Q5, Q6, LED I2 and associated circuitry. The DC pilot lamp goes out if any one of the DC ouput voltages is lost.

TABLE 2

INDICATORS

INDICATOR	FUNCTION	STATE
I1 (RED)	PILOT LAMP, 10.5VAC INPUT	ON FOR AC PRESENCE
I2 (GREEN)	PILOT LAMP, DC OUTPUT	ON FOR DC PRESENCE

TABLE 3

SPECIFCATIONS

A. POSITIVE 5.5VDC POWER SUPPLY SECTION	
INPUT VOLTAGE	10.5VAC, 47-63Hz Single Phase (Normally from an equipment shelf mounted transformer).
OUTPUT VOLTAGE	+5.5VDC, Regulated.
OUTPUT CURRENT	0-1.85 amps.
OUTPUT PROTECTION	Output current folds back to within a range of .5-1.0 amp when the +5.5VDC supply output is short-circuited. Restoration of normal operation is automatic upon short circuit removal.
LOAD REGULATION	Better than 70mV from "no load" to rated "full load" conditions.
LINE REGULATION	Inputs from 105VAC to 130VAC to the external transformer produce no output variation.
RIPPLE	20mV p.p. max. at rated full load.
B. POSITIVE 15.5VDC POWER SUPPLY SECTION	
INPUT VOLTAGE	21.0VAC, 47-63Hz Single Phase INPUT (Normally from an equipment shelf mounted transformer.)
OUTPUT VOLTAGE	+15.5VDC, Regulated.
OUTPUT CURRENT	0-1.5 amps.
OUTPUT PROTECTION	Output current goes to zero when the supply is short-circuited. Normal operation is restored by eliminating the cause of the short circuit, removing the input voltage for more than 5 secs. and then reapplying the input voltage.
LOAD REGULATION	Better than 40mV from "no load" to rated "full load" condition.
LINE REGULATION	Inputs from 105VAC TO 130VAC to the external transformer produce no output variation.
RIPPLE	20mV p.p. max at rated full load.

TABLE 3 (Cont'd)	
C. NEGATIVE 15VDC POWER SUPPLY SECTION	
INPUT VOLTAGE	Derived from the +15.5VDC supply section.
OUTPUT VOLTAGE	-15VDC, Unregulated.
OUTPUT CURRENT	0-100ma.
D. EQP-71B PHYSICAL CHARACTERISTICS	
SIZE	Height 4½" (115mm) Width 11" (280mm) Depth 2¼" (57mm)
WEIGHT	1.2 lbs. (.55kg) approximate
CONNECTIONS	All connections thru 22 etched fingers (single-sided P1)
TEMPERATURE RANGE	0° to +50° C, operating -20°C to +85°C, storage
CONSTRUCTION	Single glass epoxy plug-in board

CHAPTER 3

INSTALLATION

1.0 CONNECTIONS

1.01 Refer to Schematic Diagram EQP-71B-05.

1.02 A 22 pin card finger extension (P1) furnishes both input and output connections. The P1 pin identifications are listed in Table 1, on page 1-1.

2.0 INPUT VOLTAGE SOURCE

2.01 Refer to Schematic Diagram EQP-71C-05 and Table 1.

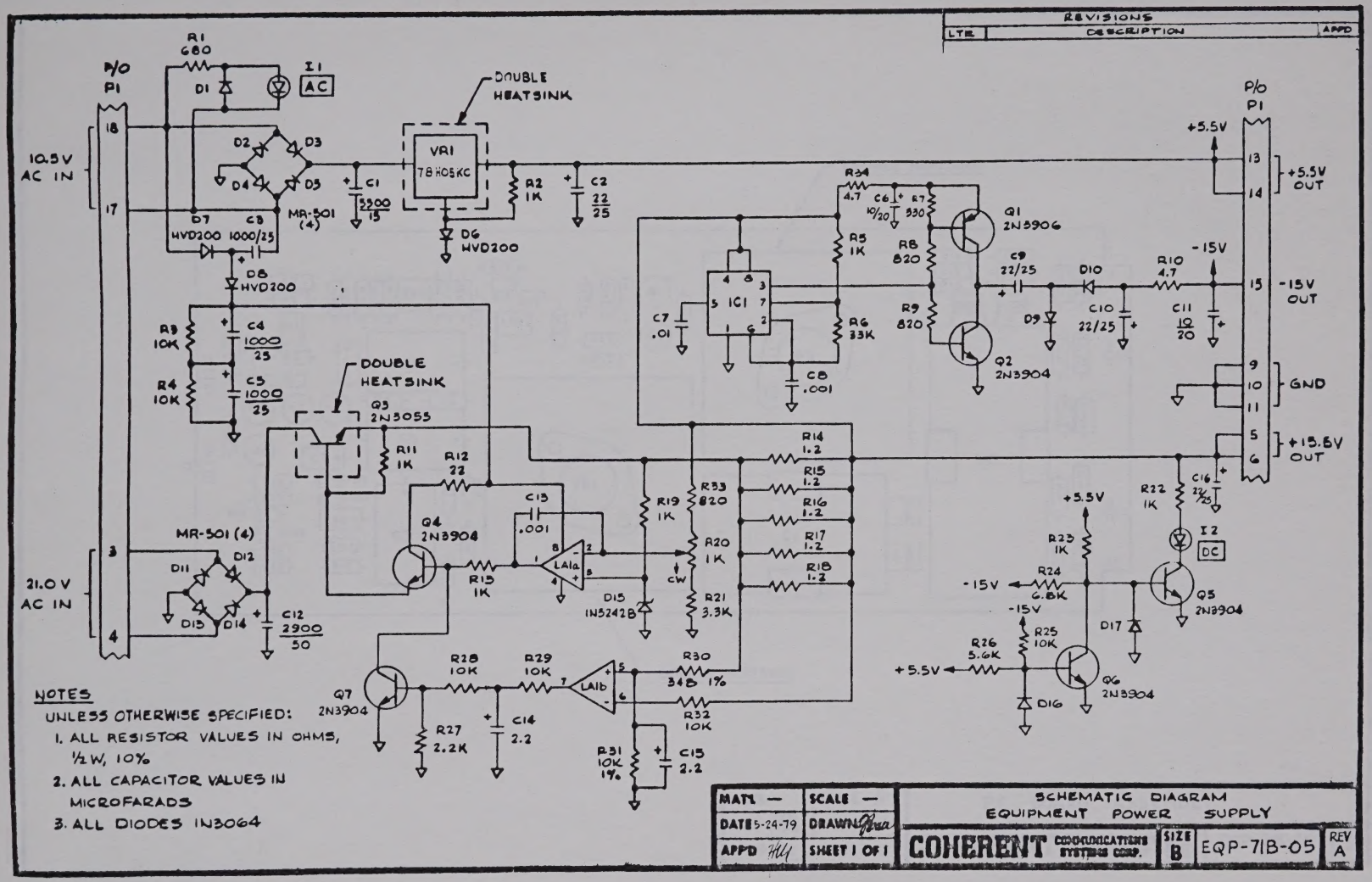
2.02 The 10.5VAC input voltages are normally supplied by an equipment shelf mounted transformer via edge connector P1, pins 3, 4, 17 and 18. The transformer has the provisions to meet BPO Technical Guide #25.

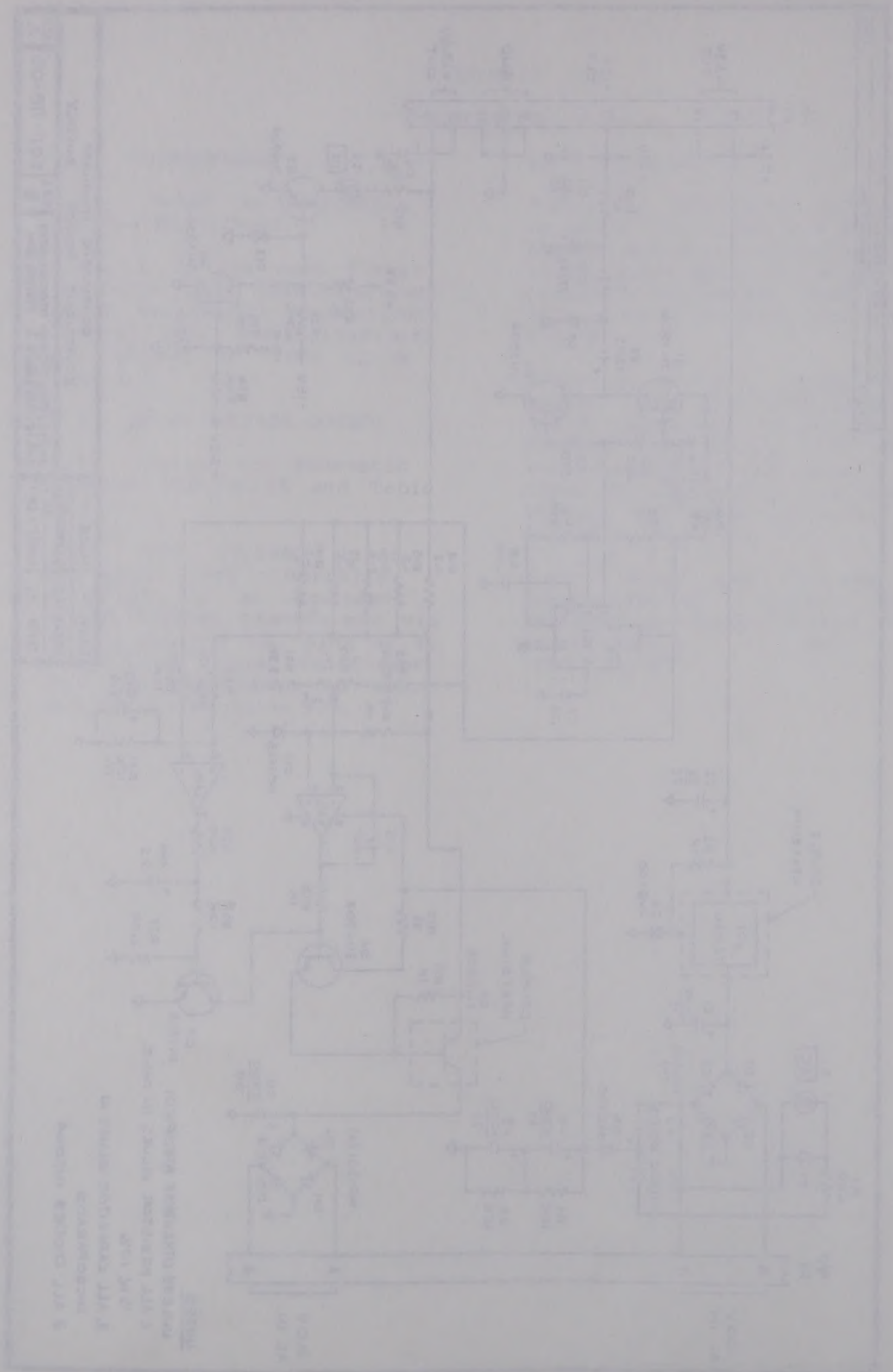
3.0 INSTALLATION

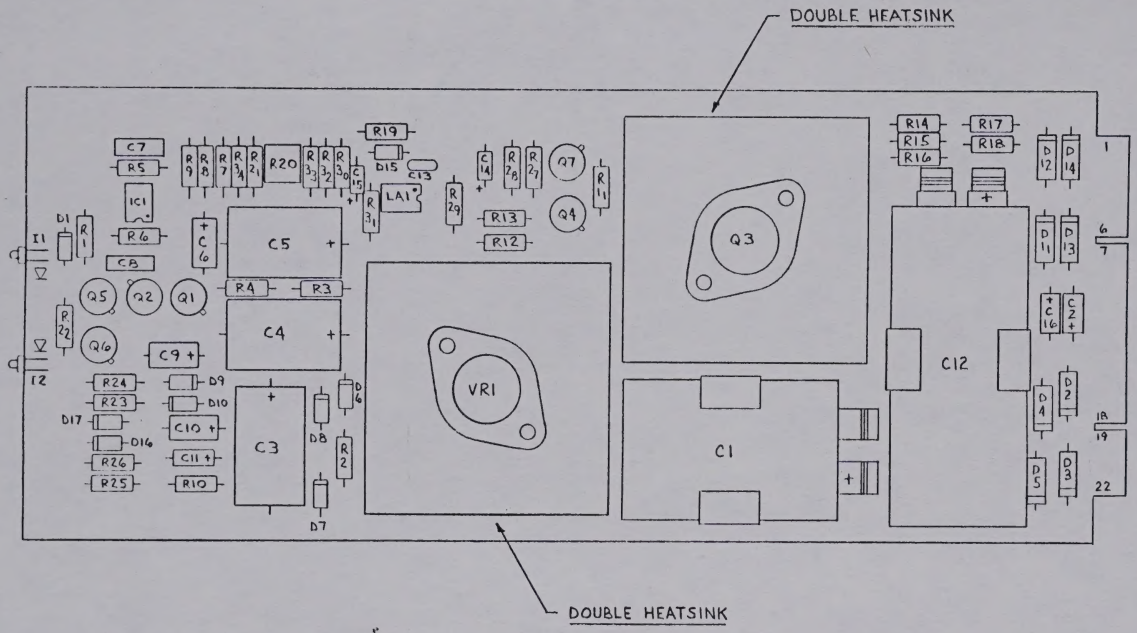
3.01 The EQP-71B is designed to mount in a Coherent EQH-8() series equipment housing. It is equipped with key slots to prevent accidental insertion into a card position not wired for it.

3.02 To install, slide the module into the appropriate shelf position, until the fingers seat firmly into the shelf connector. All connections to the module are made through the shelf connector as listed in Table 1.

3.03 Check the +15.5VDC output voltage. Correct the voltage by adjusting the 1K potentiometer R20 (EQP-71B-25).


REVISIONS
LTR
DESCRIPTION
APPD
P/O P1
10.5V AC IN
21.0V AC IN
R1 680
I1 AC
D1
D2
D3
D4
D5
MR-501 (4)
D7 HVD200
C8 1000/25
D8 HVD200
C1 3300 15
VR1 78H05KC
DOUBLE HEATSINK
R2 1K
C2 22/25
D6 HVD200
R3 10K
C4 1000/25
R4 10K
C5 1000/25
DOUBLE HEATSINK
Q3 2N3055
R11 1K
R12 22
MR-501 (4)
D11
D12
D13
D14
C12 2900/50
Q4 2N3904
R13 1K
C13 .001
LA1a
LA1b
D15 1N5242B
R19 1K
R33 820
R20 1K
CW
R21 3.3K
R14 1.2
R15 1.2
R16 1.2
R17 1.2
R18 1.2
Q7 2N3904
R28 10K
R29 10K
R30 348 1%
R32 10K
R27 2.2K
C14 2.2
R31 10K 1%
C15 2.2
R34 4.7
C6 10/20
R7 330
Q1 2N3906
R5 1K
R8 820
R9 820
Q2 2N3904
IC1
C7 .01
C8 .001
R6 33K
C9 22/25
D10
D9
C10 22/25
R10 4.7
C11 10/20
-15V
+5.5V
P/O P1
13
14
15
9
10
11
5
6
+5.5V OUT
-15V OUT
GND
+15.6V OUT
+5.5V
R22 1K
C16 22/25
I2 DC
R23 1K
R24 6.8K
Q5 2N3904
D17
R25 10K
R26 5.6K
Q6 2N3904
D16
NOTES
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTOR VALUES IN OHMS, ½W, 10%
2. ALL CAPACITOR VALUES IN MICROFARADS
3. ALL DIODES IN3064
MATL —
SCALE —
DATE 5-24-79
DRAWN
APPD
SHEET 1 OF 1
SCHEMATIC DIAGRAM
EQUIPMENT POWER SUPPLY
COHERENT COMMUNICATIONS SYSTEMS CORP.
SIZE B
EQP-71B-05
REV A





MAT'L	SCALE 1/1	P.C BOARD ASSEMBLY	
DATE JAN 1983	DRAWN		
APP'D	SHEET 1 OF 1	COHERENT COMMUNICATIONS SYSTEMS CORP.	SIZE B — EQP-71B-25 — REV A